Canada. Royal commission on
Farm machinery

[Briefs]

Massey-Ferguson Industries Ltd.

1968

Chapter VI

MACHINERY AND PARTS PRICING

The price of farm machinery and farm operation is of concern to Canadian farmers and of central concern to this Royal Commission. It is also of concern to Massey-Ferguson. Since the first intimation of the appointment of the present Royal Commission, many comments in the press and elsewhere have been directed to this aspect of the inquiry. Some of these comments may have left the impression that the farm machinery industry is willfully responsible for the present level of farm machinery prices. Massey-Ferguson believes that an impartial examination of the matter will show that such is not the case.

PRICES IN PERSPECTIVE

That prices of farm machinery have risen, however, is beyond dispute. Earlier witnesses before this Commission have furnished specific examples and averages over periods of years, to indicate rising farm machinery prices.

The recitation of such figures, however, ignores what this company believes to be a number of important considerations. One of these is suggested by the following table:

Indices for Prices of Commodities and Services used by Farmers. Base 1935-39 = 100

	August 1962	August 1966	% Increase or (Decrease)
Composite index	292.6	338.1	15.6
Equipment and materials	240.5	260.7	8.4
Taxes and interest rate	222.4	252.9	13.7
Farm wage rates	646.7	832.8	28.8
Farm family living	231.0	251.4	8.8
Farm machinery	269.1	294.2	9.3
Building material	357.5	424.1	18.6
Gasoline, Oil, Grease	146.5	149.6	2.1
Feed	250.3	237.8	(5.3)
Fertilizer	174.2	168.6	(3.3)
Twine	235.3	271.6	15.4
Seed	221.5	231.4	4.5
Hardware	262.2	291.0	11.0

Source: DBS Cat. No. 62-004

titled as above, published January 1963 and January 1967.

This table shows that farm machinery is not unique in its increased cost to farmers. Indeed, farm machinery prices which from August 1962 to August 1966 rose 9.3 percent have increased less than many other necessary farm production inputs, including farm wage rates which rose by 28.8 percent over the same period.

What is important about farm machinery --over and above its per-unit cost --is that the farmer needs so much of it in order to farm efficiently. During the Commission's hearings in Charlottetown, according to newspaper reports, it was stated that on Prince Edward

Island 29.3 percent of total farm investment is in machinery and 52.2 percent in land and buildings. The ratio in Ontario, also according to newspaper reports, is said to be 15.8 percent in machinery compared to 67.6 percent in buildings, land and livestock, and in Saskatchewan, 24.2 percent to 64.5 percent. (These ratios, of course, reflect the character of local agriculture, the size of the farms in question, etc.). And in Alberta, according to newspaper reports, the provincial agriculture minister stated that in 1965 farmers in his province had invested 14.4 percent, or more than $93.6 million, of their gross income in new machinery and parts.

Cause and Effect?

Since farm machinery does occupy a conspicuous place in the economics of agriculture it is perhaps not surprising that the industry has traditionally been examined by official investigative authorities at fairly regular intervals. In a more specific sense, there seems to be concern over a disparity between real farm income per capita and that in other segments of society.

What is behind this disparity? One suggested answer was stated before this Commission by the first vice president of the Farmers Union of Alberta: low return achieved for agricultural products resulting in farm incomes advancing only slightly over the last two decades compared to the increase in farm machinery prices.

Other similar statistics are available from a survey of other witnesses' statements, e.g., that the index of farm prices received for agricultural products in Saskatchewan rose only 1.2 percent from 1950 to 1965 while the index of farm costs for western Canada rose 50 percent (Saskatchewan government brief); and that the index of farm prices received by Alberta farmers fell 11 percent from 1962 to 1966 (Alberta Wheat Pool brief).

That farmers should find the experience underlying these statistics exceedingly disturbing is reasonable and understandable. That it should be inferred from these statistics that the farm machinery industry is responsible for the farmer's poor prices and income is not, in the opinion of this company, reasonable. MF does not believe that there is a significant relationship between farm machinery prices and prices received for farm products. To show that farm product prices have risen less than farm machinery prices is not to prove that the latter have increased unreasonably.

The fundamentals of the situation seem to be as follows: average productivity and income in agriculture seem to be low relative to other sectors, but the annual growth of productivity and income have been high. The Economic Council of Canada (Third Annual Review, page 252-3) has estimated that income, per worker, in agriculture, increased by 10.1 percent per annum over the years 1961 and 1965, compared with only 3.8 percent for non-agricultural workers. Since it seems that

Canadian farm product prices rose by about two percent per annum over those years, a significantly high proportion of the 10.1 percent is explained by physical output increases, per worker, in agriculture. This is strikingly illustrated by the fact that while the volume of total agricultural output increased at an annual rate in excess of three percent, total employment in agriculture, according to the same source, decreased at a rate in excess of three percent.

What this seems to mean is that while physical productivity increases in agriculture have been high, they, together with price increases for farm output, have not been sufficient to remove completely this disparity between average farm income and non-farm income per person. But what is also quite apparent is that if productivity increases had been less, the position of the farmer would have been inferior to what it now is.

While MF recognizes that the reasons for the realized productivity increase are complex (including increased use of fertilizer, better farming techniques and perhaps unusually favorable weather conditions) and cannot be isolated individually, MF sees no reason to disbelieve that some of the productivity increase is explained by the availability of increasingly more efficient farm machinery. In other words, the company believes that but for its success and that of others in bringing forward new machines and new models of existing machines, the financial position of the farmer would be less favorable than it now is.

All other things being equal, it is, of course, true that if the farmer's expenses had risen less than they did, his income would have risen more than it did and the gap between farm and non-farm income would have been smaller than it is. It is, therefore, quite valid to consider whether his cost, including machinery costs, have risen more than they should have. However, before doing so, it is perhaps worthwhile to recall that there are great differences among farmers, with respect to the state of their financial position. The top two percent of Canadian farmers produce 20 percent of all its food, and the top 30 percent produce 70 percent of the food. This, of course, means that 70 percent of the farmers produce only 30 percent of the food (1961 Census of Agriculture - Dominion Bureau of Statistics).

While MF has not been in a position to examine the matter in detail, there would seem to be at least a possibility that if all farming land was operated as efficiently as that of the group that produces 70 percent of the food, then even at existing prices and costs, the disparity between farm and non-farm income might be much reduced. Certainly it would seem to be crucially important to know if the problem of farm income is not essentially one of structural readjustment, rather than one of unit input and output prices.

Returning now to a consideration of the farmer's costs, and particularly his machinery costs, the table below compares the increase in selling prices of agricultural implements with certain relevant groupings of

the general wholesale index and with wage rates in manufacturing.

Selected Price Increases: 1960 to 1966

Agricultural implements - industry selling price	+ 9.3%
General wholesale index	
- Non-Farm products	+ 10.8%
- Iron and non-ferrous metal products	+ 17.0%
- Raw and partly manufactured goods	+ 15.8%
- Fully and chiefly manufactured goods	+ 11.1%
Average hourly earnings in manufacturing	+ 26.4%

Source: Dominion Bureau of Statistics Canadian Statistical Review; based on monthly average figures for the years 1960 and 1966.

It seems clear from these figures that the increase in farm machinery selling prices since 1960 compares favorably with the increase in the prices of the major groupings of the general wholesale price index, and that it is much smaller than the increase in labor costs of 26.4 percent over that period. Indeed, the average gross hourly earnings of MF's Canadian wage employees rose from \$2.35 in 1960 to \$3.34 in 1966 --an increase of slightly over 42 percent.

Some might say that productivity increases in the agricultural implement industry have been so great that even the comparatively ordinary price increase that did occur should not have occurred. While MF takes pride in its success in building an efficient manufacturing organization, the fact remains that strong and persisting competition throughout the

industry ensures that such improvement will not be reflected in excessive profit.

MASSEY-FERGUSON LIMITED'S EARNINGS

One of the earlier witnesses before this commission has quoted to it certain Massey-Ferguson financial results. The witness said that MF's 1966 sales had increased 15 percent over 1965. This is correct. He said that MF profits were up 33 percent over 1965. This was an error on the witness's part. A glance at the first page of the Massey-Ferguson Limited 1966 consolidated annual report will show a 1965 net income of $40.1 million and a 1966 net income of $45.2 million, or an increase of 12.7 percent --and significantly lower than the 15.4 percent sales increase upon which it was earned.

Worldwide Return on Assets and Shareholders' Equity

Perhaps two of the more significant economic measures of a company's profitability are its percentage of net profit to assets employed and percentage of net profit to shareholders' equity. The table following shows this information for the last 10 years.

		Return On Assets Employed		Return On Shareholders Equity	
Year	Net Income	Total Assets	Return On Assets	Total Equity	Return On Equity
	$ mil.	$ mil.	%	$ mil.	%
1957	(4.7)	286.1	(1.6)	145.0	(3.2)
1958	13.0	310.0	4.2	153.3	8.5
1959	21.0	465.3	4.5	193.9	10.8
1960	13.2	458.0	2.9	200.9	6.6
1961	15.2	507.9	3.0	210.8	7.2
1962	18.1	533.5	3.4	222.8	8.1
1963	24.1	560.8	4.3	253.5	9.5
1964	45.0	621.4	7.2	290.4	15.5
1965	40.1	741.6	5.4	323.4	12.4
1966	45.2	845.8	5.3	428.6	10.6
1957 - 1966 Average Return			3.8		8.6

MF believes that the 10-year average of 3.8 percent return on assets is considerably below what it should be and that it is important to improve it. The difference between last year's 5.3 percent and a percentage that might be considered desirable, would, however, by no means come from increased prices alone. Most of it would come from increased operating efficiencies and deeper market penetration. With respect to return on shareholders' equity, Massey-Ferguson believes that its 10-year average return of only 8.6 percent is less than desirable and that the 1964-1966 trend, which represents approximately a one-third decline, must be reversed.

Worldwide Net Profit-To-Sales Ratio

For sake of comparison, but of less significance, is Massey-Ferguson's

experience with net profit as a percentage of sales. The 10-year history of return on sales (shown in the table below) demonstrates a very unusual return. Massey-Ferguson is concerned that its percentage return on sales has actually decreased over the last several years, a period, some witnesses have strongly implied, of excessive profits. The MF record eloquently refutes this charge to whatever degree it was intended to apply to Massey-Ferguson.

Return on Sales

Year	Sales	Net Income	Return On Sales
	$ mil.	$ mil.	%
1957	390.8	(4.7)	(1.2)
1958	420.2	13.0	3.1
1959	478.5	21.0	4.4
1960	490.4	13.2	2.7
1961	519.3	15.2	2.9
1962	596.1	18.1	3.0
1963	685.7	24.1	3.5
1964	772.0	45.0	5.8
1965	808.5	40.1	5.0
1966	932.1	45.2	4.8

Looking at MF profits from the standpoint of percentage of sales, the company averaged a 3.4 percent return over the years 1957 - 1966. This leads to the rather obvious, but nonetheless frequently forgotten point, that if no profits at all had been made, farm machinery prices would have been only slightly lower than they in fact were.

To conclude, MF would suggest that the increase in farm machinery prices is part of a general rise in prices and that the company's labor and material costs have risen more than agricultural machinery prices, and that even with the strenuous efforts of the company to increase its efficiency in every functional area it still has not achieved a satisfactory level of profit. In short, it cannot be said that the increase in MF prices is explained by high profit. The company believes that the Commission would find that the farm machinery industry is not known among financial analysts as a high profit industry.

PRICING PRINCIPLES

The Commission has asked, "How do you determine prices on your main lines of equipment...?"

There is no simple answer. Nor is there a formula which permits MF to take certain information, make simple calculations and produce a price. MF prices for new products are established at the time those products are introduced, based on cost information accumulated during the development of the products and adjusted in relationship to competitive levels prevailing at the time of introduction.

At the time a possible new product is being evaluated, the anticipated obtainable price is analyzed in relationship to the product's cost to the company, and a decision to proceed or not to proceed is made

based on the potential profit to the company. Once a decision is made to proceed, the necessity to make a profit does not play a large part in price determination; rather, price is generally related to competitive levels. The exception is when the company is assessing elastic price/volume relationships, i.e., where there is reasonable flexibility in possible pricing, MF prices to the optimum profit point on the price/volume curve.

Beyond the establishment of an initial price, an annual review is made of each machine's price, taking into account the trade position of the product over the past year and specification and environmental changes known and envisioned for the coming year.

What Prices Must Cover

In general terms prices are set through a judgmental process involving the following factors:

- the necessity to make a profit;
- the product's value to the customer compared to competitor's counterpart products;
- the necessity to meet price competition in the market;
- the necessity, in the long run, to cover all the initial investment and recurring costs of engineering, manufacturing, distributing and marketing, including associated supporting services, e.g., costs of recruiting, fringe benefits, office services.

Profit: Stepchild of Costs

It is axiomatic that any company is in business to make a profit. It can generate that profit only through selling of products for more than they cost to engineer, manufacture, distribute and market. The control over the costs involved in many of these last named activities is limited. For example, the cost of materials for MF's products accounts for about 59 percent of its manufacturing costs in Canada; labor accounts for 33 percent. MF has only partial control over these required inputs whose costs are largely determined by the economic environment.

Rising production costs are one of management's greatest challenges. The company attempts to minimize them by introducing labor-saving equipment, through better plant and office techniques and procedures and through finding larger markets so as to realize economies of scale in manufacturing. The company constantly analyzes the markets in which it must purchase its manufacturing input materials so as to ensure that it minimizes their cost. MF attempts to conduct its labor negotiations in a realistic way. Distribution and marketing are also constantly under review in order to find ways to reduce cost.

Engineering costs, of course, are subject to day-by-day administrative control and to top-level decisions concerning types of products to be developed. Overly stringent cost control of these items, however, would, in the short run, only compromise a project's chances for success and,

in the long run, threaten the company's basic ability to compete and reduce its ability to serve the farmer through helping to increase his productivity.

Profit: Stepchild of Competitive Pricing

The price established, in order to provide a profit, naturally must be such that it generates sufficient volume to recover the investment the company has made in developing the product in addition to the direct production and marketing costs.

Profit generation, of course, is why MF is in business. Without it the company would not survive. Even so, it is by no means always possible to obtain a satisfactory profit from all machines sold. This is because the generation of profit is the essential result of a confrontation of cost pressures and competitive pressures, or, alternatively of supply and demand forces. The company's natural desire for survival tends to drive the price upward so as to cover costs and increase profits; the necessity to compete drives it back. Competitiveness in pricing is necessary to obtain the volume necessary to cover the company's investment in the product.

In cases of relatively similar machines, the process of "pricing to competition" is likely to be the dominant force, and therefore the minimization of costs is crucial for the preservation of satisfactory profit.

In cases where significant "value" differences exist between the machines of one company and the most nearly competitive machines, it may be possible to price such machines above those of competitors. Customers may want the unique features of the machine in question and they may be prepared to pay for them. This they may be willing to do because of reduced maintenance cost or increased "output" per dollar of investment. As long as the farmer's annual income is increased more than his costs --including depreciation and finance charges --it presumably will make good economic sense for him to buy the machine in question.

It is possible that the profit margin on such a machine will be bigger than on machines which are very similar to competitors'. Certainly the profit margins are not the same for all machines at all times. At the same time, if new features cost more than those on competing machines and more than the farmer believes they are worth to him, it is quite possible that a machine with unique features will end up having a smaller profit margin than others that are quite similar to those of competitors. Massey-Ferguson has had experience with all these possibilities.

Definitions

The following glossary will facilitate discussion.

Dealer price (wholesale price): the price at which MF sells wholegoods and parts to its dealers.

Suggested list price (retail price): the price at which MF suggests wholegoods and parts should be sold to the dealer's farmer-customer.

Dealer discount: the difference between the suggested list price and the dealer price, usually expressed as a percentage.

Will-Fit competition: parts companies who sell fast-moving parts for MF machines in direct competition with MF.

WHOLEGOODS PRICING

Pressure of competitive pricing and the company's judgment of a machine's unique value to the customer, then, are the prime overall considerations in establishing price. Each machine receives independent price assessment. Increased value to the consumer and a strong competitive position would tend to increase prices; if these factors were reversed, the tendency would be to lower prices. For example, two of Detroit-assembled tractors, the MF135 and 165, are currently being offered in Canada at lower prices than in the U.S. This pricing reflects competition being experienced in the Canadian market from European tractors.

Annual Price Reviews

How, then, does the company actually proceed in its annual price reviews of any particular machine; proceed, that is, beyond the point of estimating market demand, applying to that demand the market share

which might have been held the previous year, and adjusting prices for changes in production costs. A primary approach is to complete a price and value competitive summary, an outline of which is shown below. ("Surcharge", fifth line below, refers to the exchange factor).

MF Price and Value Competitive Summary

PRODUCT:					
19	MANUFACTURER				
	MODEL NUMBER				
LIST PRICE					
SURCHARGE					
LIST PRICE including Surcharge					
PRICE Over/(Under) MF					
VALUE Over/(Under) MF					
Total Price & Value Variance relative to MF					
DEALER PRICE less V. & P. Discounts					
SURCHARGE					
DEALER PRICE including Surcharge					
PRICE Over/(Under) MF					
VALUE Over/(Under) MF					
Total Price & Value Variance relative to MF					
MARKET PENETRATION POSITION					
FREIGHT to Over/(Under) MF					
F.O.B. POINT					

This sheet compares MF price data against those published by competitive manufacturers. For ease of comparison, lower-priced machines appear to the left with higher priced machinery appearing progressively to the right. Information is gathered on competitive machines by a review of the competitors' brochures, trade journals, personal observation, and testing of the competitive machine by MF product specialists. Such

information covers quality, utility, performance, customer acceptance or resistance, features offered, horsepower, and travel speed for self-propelled machines, output for implements, grain losses for combines, complexity of repairs and maintenance, expected machine life, convenience to the operator --in short, all the factors which can be quantified to some extent and which have an effect on the machine's productive value to the farmer.

Massey-Ferguson, of course, also estimates what its competitors may be planning to do with their counterpart machines and their prices. Then MF product specialists translate, insofar as possible, all this into dollar amounts. These are totalled and the difference between the total and the MF price is entered on the "VALUE over/(under) MF" line.

It should be noted that the company compares published prices at the price-to-dealer level because MF must also be competitive at this level. Further, although the dealer price charged by the company for wholegoods, attachments and accessories represents a 23 percent discount from suggested retail list prices, the dealer is under no obligation to charge the retail prices recommended in the company's machine price lists. (In addition to the margin the dealer realizes on retail sales, the average dealer earns a 6.5 percent volume and performance bonus on his total new MF wholegoods sales).

With reference to the table on page 35 of chapter V, it is interesting to note that dealers typically do not realize a 23 percent margin: the North American average for the respondent group of dealers was 12.0 percent; for the Canadian group the figure was 12.3 percent. Thus it is reasonable to suggest that the actual price of new wholegoods to the Canadian farmer is substantially less --perhaps 10 percent less -- than might be indicated by perusing suggested retail price lists.

Additional facts relating to competition that must be considered in establishing specific MF machine prices include:

- reputation for machine quality and parts service;
- warranty policies;
- dealership structure and training programs;
- machine financing and other credit available to the dealer;
- physical distribution patterns;
- geographical region(s) of machine's concentrated use;
- extent of field inventories.

One of the more subtle problems in price determination is estimating what effect the machine's current price will have on the demand for and consequent purchase of the machine and then adjusting the price

to achieve optimum profitability through optimum sales. The bigger the sales the lower, frequently, are unit costs of production, and this must be taken into account. The data gathered and forecasts prepared by the marketing and economic research (MER) section (described in the previous chapter) is helpful in estimating the basic dimension of the demand for the machine.

This process, however, is not without considerable risks because of difficulties in forecasting demand. For example, over-estimated demand leads to excessive and non-recoverable capital investment in tooling facilities.

Over-estimated demand leads to expensive inventories, costly liquidation programs and to severe financial penalties; conversely, under-estimated demand means loss of sales and profit through lack of machines, unnecessarily low prices, and some sacrifice of the benefits of economies of scale, which a bigger run would have created.

In sum, for the most part, Massey-Ferguson must price to competition -- and, hopefully, produce enough revenue to cover costs and provide for a competitive return on its assets. Value to the customer of MF machines compared to competitive machines is an important determinant of price in some cases. But in most cases strong competitive pressure in the industry means that cost savings within the company are the principal means by which the company can strengthen its competitive position in

the market and its financial position.

It was stated earlier that MF has no price formula to rely on in determining prices. Price determination, indeed, is a highly complex process and carries many risks. In the end, it involves applying judgment based on knowledge of markets, of competition, of production costs and of comparative machine values. To blend all these components requires intuition derived from experience and observation. Intuition defies description. Its precise mechanisms are not known. With the increased adoption of the scientific method, intuition may have begun to appear disruptable. Intuition may seem to insult order and logic, and it certainly has offered few quantitative explanations of the solutions it produced. Yet today, in the age of computers and sophisticated information handling systems, which promise to heighten the usefulness of man's knowledge, scientists are also beginning to suggest that use of intuition is not irrational. Indeed, it may be that intuition stems from the individual's own built-in computer and information retrieval system. Massey-Ferguson is happy to take advantage of what nature has provided. In any case, in the matter of price determination within the complex environment of the competitive farm machinery industry intuition occasionally plays an important role.

PATTERN OF PRICE COMPETITION

The Commission has asked: "When prices are changed do you usually

wait until some other firms announce their prices?" and "Is there a pattern of price leadership in the industry?" Since these questions in some respects are related, they shall be treated together.

No Industry Pattern Established

The basic answer to the first question is, No, MF does not wait until some other firms announce their prices. Among the major competitors, the type of pricing considerations described earlier in this chapter seem to be generally recognized. Consequently, pricing actions tend to be similar in most instances. As a matter of general pricing policy Massey-Ferguson does not --and cannot afford to --wait to see the new prices of competitors before it determines its own, even though it certainly tries to estimate what the competition's new prices will be.

The company does not believe there is any price leadership in the industry. But a pattern might appear to exist in the timing of announcements of new prices.

For reference purposes, listed below are the release dates of MF price changes (increased or decreased) for the years 1961 through 1967:

Fiscal Year	Date of Change	Machines Affected
1961	Dec. 26/60	Tractors and combines
	Jan. 2/61	Other machines
1962	Jan. 17/62	New tractor (Super 90)
	Feb. 7/62	Continuing tractors
	Feb. 26/62	Other machines

Fiscal Year	Date of Change	Machines Affected
1963	Dec. 5/62	All machines
1964	Nov. 1/63	Mowers and rakes
	Nov. 18/63	All other machines except tractors
	Nov. 25/63	Tractors
1965	Nov. 2/64	Balers
	Dec. 15/64	Tillage, planters, mowers and rakes
	Dec. 28/64	Plows
	Jan. 4/65	New tractor line and combines
	Jan. 15/65	Tractor accessories
1966	Dec. 17/65	Balers
	Jan. 3/66	Combines, mowers, rakes
	Jan. 17/66	All other machines
1967	Nov. 1/66	All machines except combines

Annual Price List Issuance

MF prefers to issue price changes on any one machine only once a year. The company further attempts to make price changes effective in the early months of its fiscal year. However, sometimes it is not possible to issue a whole new price list at one time. Sections of the new list may, therefore, be issued at intervals, say, between November and February.

The lists are issued simultaneously to all of MF's Canadian dealers. Once the new prices have been determined and issued to dealers, the company attempts to avoid further price changes before the following fiscal year. This practice, not always possible to maintain, prevents confusion and misunderstanding.

It must be noted that Canadian farm machinery prices are probably significantly influenced by competitives influences from abroad, particularly the U.S.

The U.S. farm machinery market is the largest and the most competitive in the world. Products made in the United States not only supply the U.S. market, but most of them suit Canadian conditions. Canada is America's best export customer for farm machinery. Canadian prices for this machinery bear a relationship to U.S. prices with exchange and transportation factors allowed for. North America, by and large, constitutes one market for farm machinery in which U.S. market influences predominate, a circumstance of benefit to the Canadian farmer, the only Canadian consumer who pays par prices with the U.S. customer for capital goods.

Intent of Timing and Issuance Procedures

With regard to timing of new prices, Massey-Ferguson in Canada has historically been later than some other companies in issuing its new fiscal year prices. One reason for this delay is to create an incentive for late fall purchasing by customers at the previous year's prices. The delay also encourages dealers to order for fall delivery, which relieves MF of certain storage costs. Another reason for MF delay is that price changes are often related to product changes and their introduction which may occur significantly after the beginning of the fiscal year.

Simultaneous distribution of price lists and price changes and f.o.b. factory or seaboard base pricing result in no MF dealer having an advantage over any other, other than the cost differential of moving his goods.

When prices advance, dealers are given 10 days notice so they can cancel orders already placed with the company. When list prices are reduced on a machine, the dealer is reimbursed for the difference in price on new, unused machines in his inventory. It should be noted that from time to time the company grants trading allowances to dealers to facilitate and encourage the sale of slow-moving, discontinued, shop-worn or weathered machines. This practice helps reduce dealers' and MF's inventory costs.

When prices are increased, the increases, at the dealer's option, may be retroactive on the machines then in his inventory.

Policy on Freight Charges

The Commission has asked: "Is your equipment all sold f.o.b. your factory? Or do you absorb some freight on shipments?" MF machinery manufactured in North America is sold to Canadian dealers f.o.b. the factory points indicated in the price list. If MF prepays freight, the dealer reimburses the company. Transportation and freight rates will be treated in detail in chapter VII.

Repair parts are also priced to the dealer f.o.b. point of origin. However, the normal point of origin for parts is considered to be a company branch, rather than the facilities which manufactured them. This is because the great number of parts and sourcing points make it impractical to price parts f.o.b. the producing factories. In some cases, as explained in chapter X on financing, the company pays the entire freight on parts.

Machines imported from overseas are priced f.o.b. North American seaboard. The freight cost from overseas factories to the North American seaboard is included in the price of the machine.

Tractor accessories and some combine accessories are priced f.o.b. distributing warehouses at Brantford, Ontario or Racine, Wisconsin. Such accessories, because of size and weight, lend themselves to central warehouse distribution, thus overcoming excessive "less-than-carload" freight costs. This also avoids taxing dealers with a multitude of freight calculations from a large number of factory sources.

The company's approach and practice on price determination, suggested list prices and f.o.b. charges is identical throughout North America.

PARTS PRICING

How does MF determine prices to be charged for parts? The same need to

compete, yet still cover costs and provide a profit, applies to parts pricing as it does to wholegoods pricing. However, parts price determination and administration is complicated by the fact that the inventory contains over 100,000 different kinds of parts, some manufactured in Canada, some manufactured in the U.S.; some manufactured by MF, some manufactured by outside suppliers.

In general, the pricing on these parts is advantageous to the Canadian farmer in that he does not pay the full exchange rate; normally he pays five percent, as opposed to the current seven or eight percent exchange rate. Here again, the Canadian farmer is the only Canadian consumer of capital goods who can purchase them on a par --or even more favorable --basis with his U.S. counterpart.

The provisioning of 100,000-plus parts entails many costs not readily apparent. Among them are the concomitant financial penalties of obsolescence, of carrying lifetime builds of certain parts, and the associated warehousing and material handling costs of providing farmers with immediate availability of all parts through the lifetime of his machine. These costs, of course, must all be incorporated in parts pricing.

Competitive Parts and Pricing

There are parts in the MF inventory which are also manufactured or sold at wholesale or retail by other companies and which can be used in

place of parts offered through MF dealers.

The essential factor for qualification as a competitive part is existence of direct competition in response to which MF must price competitively.

Competitors in these parts includes discount stores, fleet farm stores, will-fit parts distributors and manufacturers and, in some cases, MF suppliers or other major manufacturers. MF's competitive parts pricing strategy is simple: compete as vigorously as possible at both the wholesale and retail levels --while accommodating both company and dealers' cost and profit needs. More specifically, at wholesale, this policy means pricing slightly higher than the lowest competitor for a part of reasonably comparable quality. At retail, it means a suggested list price in line with the lowest competitive price for parts of reasonably comparable quality.

A competitive part will be priced based on a comparison, if possible, with Canadian and U.S. published prices of:

- similar existing MF parts;
- other full line farm machinery companies;
- major suppliers of the particular part or type of part;
- will-fit or short line suppliers, if applicable;

And on:

- contact with field personnel regarding competition;
- value analysis if no precedent has been established in the industry.

Non-Competitive Parts and Pricing

The essential qualification for this category is absence of direct competition. This notwithstanding, MF recognizes that to survive in the long term it must price competitively. Competitive pricing, indeed, is company policy because MF is interested in more than short-term sales of parts for machines already owned by farmers.

It is in the company's interest to perpetuate the customer's MF buying behavior --and MF knows he will consider his experience with MF parts replacement expense before he buys another machine. Therefore, the company must compete for his purchase of a future machine through pricing of replacement parts he needs today.

To achieve the necessary competitive edge --and to cover costs and earn a profit --MF pricing of all parts is under constant review. Overall parts strategy, i.e., increasing the MF share of the market through providing quality parts at reasonable prices, demands such reviews.

Pricing policy for non-competitive parts is to establish prices which

are fair and equitable for the company, the dealer and the customer. Price determination for these parts takes into consideration:

- prices of other companies for similar parts;
- the importance of the part's function within the machine;
- high or low sales volume potential;
- need to cover costs and produce profit.

Non-competitive parts are priced according to their source. MF-manufactured parts are priced through:

- comparison with similar existing MF parts in order to maintain "family" cost relationships, i.e., opposed parts, parts replacing existing parts, etc.;
- value analysis through visual inspection of the part and/or blueprint. This is done by applying a fixed rate for specific materials, machining operations, etc.

These methods plus applicable exchange adjustments establish the list price. The dealer discount averages 32 percent on items individually valued up to $100. The discount on items over $100 is approximately 20 percent because they are not normally stocked by dealer.

Purchased parts which are supplier-controlled are priced on the basis

of the supplier's published list and/or dealer price.

If one only price --either dealer or suggested list price --is published by the supplier, MF adheres to whichever price is published and establishes the remaining price --either suggest list or dealer --based on the normal MF discounts, as explained previously. If both a dealer and a suggested list are published, the supplier dealer discount is followed.

Purchased parts which are MF-controlled are priced by mark-up over cost to MF's. The mark-up is determined individually for different suppliers and for their "families" of parts. This ensures avoidance of exorbitant pricing.

Dealer discounts, as explained previously, are 32 percent, with the exception of items over $100 which are only 20 percent.

In price determination for all these groups, MF applies judgment to avoid exorbitant pricing and to maintain price conformity with visually apparent value.

Price for individual part numbers within the above classes of parts are maintained and updated through:

- review of competitive information;

- review of supplier price lists;

- field reports and customers feedback regarding replacement part expense.

Pricing of MF-Manufactured Parts

Prices are established upon receipt of a new part and its factory invoice showing direct cost of manufacture in U.S. funds.

A pricing analyst then inspects the part to determine which combination of pricing methods will apply. The method(s) he selects establishes an equitable selling price that provides a fair profit margin for both MF and the dealer. At the same time, the pricing analyst ensures that the customer is receiving a fair value for the price of the part.

Selling price is determined by mark-up on cost and a visual inspection to ensure the price represents a fair market value for the part. Comparisons are made between the part and family-related MF parts as well as between similar parts on competitive machines. Consideration is given as well to the importance of the part in the machine.

If no data on nearly identical parts are available for comparison to assist the pricing analyst in establishing the price, a value analysis is made to test the validity of the cost mark-up. Such analysis applies a list price value for material and various machining operations performed in manufacture of the part.

EXAMPLE:

144 807 M91 -- link assembly

Factory invoice cost $.67

Cost mark-up = 3 x cost = U.S. list $2.01 (U.S. dealer $1.37)

Price data on similar, but not strictly comparable, parts:

- MF part (similar part with more components)
  U.S. dealer $2.61; U.S. list $3.84

- Company A parts -- similar parts only:
  U.S. dealer prices range from $.87 to $2.05
  U.S. list prices range from $1.38 to $3.26

- Company B parts -- similar parts only:
  U.S. dealer prices range from $1.15 to $1.79
  U.S. list prices range from $1.78 to $2.75

However, value analysis of this part's material and machining operations established a U.S. list price of $1.63 and a resulting U.S. dealer price of $1.11.

This price was determined by the pricing analyst to be the most equitable price and was the final price established for the U.S. market. The Canadian price is established by adding five percent to the U.S. list and dealer prices. The purpose of this mark-up is to

recover part of the exchange rate between U.S. and Canada.

Price at Retail

The company's influence over the exact retail price is limited to suggesting a list price to the dealer. He is free to deviate from it, to his own profit advantage or disadvantage. Parts do not carry a uniform dealer discount. Currently, the weighted average discount to the dealer is approximately 30 percent of the suggested list price. It is based on a consideration of local competitive forces and provides the dealer with reasonable return in relationship to his inventory turn-over rate, handling and freight expenses, etc.

To conform to MF's policy of furnishing parts long after a machine's last production run, the company incurs high costs from warehousing, interest charges, short parts runs and manufacturing set-up and tooling charges. MF attempts, of course, to control costs through the most advantageous mix of investment and timing. Still, the expense of manufacturing and distributing the 100,000-plus parts necessary to service the entire line is considerable. For some parts --particularly slow-moving parts for old machines --the actual number sold is so small as to appear unrealistic, from a profit point of view. When possible, to keep the cost to the farmer within reasonable bounds, MF absorbs certain of these cost elements.

Canadian-U.S. Price Differential

The 1967 Canadian price level is five percent above the U.S. price level except on competitive parts. These Canadian and U.S. levels are advantageous to the Canadian farmer in that they do not pass on the full exchange rate.

* * *

In summary, Massey-Ferguson realizes that farm machinery prices are of great importance to the farmer who has had to face ever-increasing production costs. MF too has faced such cost increases and when taking these into account MF believes it has acted responsibly in its pricing policy, both as it relates to wholegoods and parts. MF's prices have risen, but they have not risen out of proportion with its increased engineering, manufacturing and marketing costs. Indeed, had MF's own internally induced efficiency not grown over recent years --a result, in part, of its internationally integrated engineering, manufacturing and marketing activities --it would not have been able to keep farm machinery prices down to their present levels.

Considering the farm machinery industry as a whole, MF believes that there exists intense competition that precludes the possibility that any portion of price increases in it will be explained by excessive aggregate profit.

Chapter VII

MACHINERY DISTRIBUTION

In the distribution of products, Massey-Ferguson faces a number of problems, some of them common throughout the farm machinery industry, some of them not. MF, as all other manufacturers, must constantly contend with the problem of getting the proper machine to the dealer whose customer has ordered it, as expeditiously and economically as possible.

Satisfying the customer today in order to retain his business tomorrow motivates MF to strive for an increasingly smoother system. In addition, the more smoothly the company's distributing pipeline system works, the fewer machines tend to be in the pipeline -- thereby reducing inventory costs.

These are considerations facing all manufacturers, regardless of location. MF, however, with two-thirds of its North American manufacturing footage located in Canada, faces other problems which put it at a distinct transportation cost disadvantage with respect to farm machinery manufacturers located in the United States.

Massey-Ferguson's own studies show that it is at a transportation disadvantage in 86 percent of the North American farm machinery

marketing area. The map on the following page shows the areas of advantage and disadvantage. The company's study shows a deterioration in its position since 1956 based on the report of that year on the Canadian agricultural machinery industry by J. D. Woods and Gordon Limited. Woods and Gordon indicated that at the time of their study, MF was at a disadvantage in only 74 percent of the geographical area of the North American farm machinery market.

Regardless of the precise ratio involved, the disadvantage to MF is several-fold: (1) Canadian railroad transportation rates, in general, are higher than U.S. (a comparison of these rates follows later in this chapter); (2) MF products from Canada must not only transverse the geographical area, i.e., Canada, where the higher rates are in effect, but in total, tend to be separated by greater distances from consumers than those of U.S. manufacturers.

The extent of this geographical distance disadvantage and the effect of lower U.S. rates are both reflected on the map shown. A slightly more subtle aspect is the fact that, by and large, the richer portions of the North American farm machinery market lie beyond the 14 percent of the geographic area in which MF does enjoy the advantage.

These circumstances amount to a substantial competitive disadvantage because, notwithstanding the transportation costs, the company and its

1967

Approximate Division of Canadian and the United States Market for Agricultural Machinery based on Freight Rates from Toronto and Brantford and Industry Centres in the United States

14% favorable to Massey-Ferguson
86% favorable to United States industry

dealers have to meet competitive prices in the market. This lowers the return to the company from, say, the sale of a Brantford-produced MF combine in Iowa compared to the return to a competitor who, say, manufactures combines in Illinois and sells them in Iowa, just across the Mississippi river.

SHIPPING PRACTICES

Massey-Ferguson ships wholegoods to Canadian dealers both directly from factories and through warehousing points strategically located across the country. These facilities and the regional coverage they provide are:

- the Montreal branch and its sub-branch at Moncton which cover Quebec and the Atlantic provinces;

- the Toronto branch and its London sub-branch which cover Ontario;

- the Winnipeg branch which covers Manitoba;

- the Saskatoon branch and its sub-branch at Regina and a warehouse at Yorkton which cover Saskatchewan;

- the Calgary branch and its sub-branch at Edmonton which cover Alberta and British Columbia.

(In addition to these supply points, dealers occasionally may receive goods transferred from other MF dealers.) These locations also have responsibilities for the distribution of parts, a subject covered in the next chapter.

SHIPMENT ROUTING AND HANDLING OF FREIGHT CHARGES

In Canada, all MF machinery is sold to the dealer f.o.b. factory or North American seaboard base. Technically, this means that the method of shipment of his goods is his concern. The company recognizes, however, that the dealer generally does not have the specialized knowledge to select the most economic and efficient mode of transportation. Therefore, MF offers assistance in this regard. This assistance is incorporated in a series of evaluations which begin when the dealer orders a machine.

Determination of Supply Point and Type of Shipment

The process begins when the dealer places an order with his branch and states an approximate delivery date requirement.

The branch assesses the order and decides how it should be shipped. There are a number of possibilities.

If the dealer orders a quantity of machines sufficient to load a full carload or truckload, and the items are not in branch warehouse inventory, an order will be placed on the factory. The branch will specify direct-to-dealer shipment, if available, to minimize freight charges. Even if the branch has the number of machines in inventory required to satisfy a dealer's carload or multiple carload order, the branch will place the order on the factory to provide the dealer the benefit of the lower direct-from-factory freight expense.

In 1966, MF branch requisitions show the following percentages of direct-to-dealer shipment:

Direct Factory-to-Dealer Shipments - 1966

Machinery	Canadian Distribution % of Total	North American Distribution % of Total
Hay balers (from Toronto Works)	58	62
Tractors (from North American Tractor Plant in Detroit)	15	43
Combines (from North American Combine Plant in Brantford)	65	70

If the dealer orders a quantity of machines of less-than-carload or less-than-truckload lots, and the items are not in branch inventory, the branch warehouse will review other dealers' current orders and will attempt to consolidate two or more orders. The branch places the order

on the factory and indicates that the carload or truckload should be stopped-off for unloading at the respective dealer locations.

If the dealer orders machines for immediate delivery which are in branch inventory, the branch warehouse determines how the order can best be handled. For example, if the dealer has ordered a carload of machines, the branch warehouse will ship it, if possible, under the storage-in-transit freight rate.

If the dealer orders less than a full carload, the branch will review other dealer orders and if possible, consolidate orders and ship under the storage-in-transit arrangement, with instructions to the railway to stop the car for partial unloading at the dealer locations.

If the dealer's order cannot be consolidated for shipment with other orders on hand, or cannot be held to be consolidated with other orders, the dealer's order will be shipped on a less-than-truckload basis. Of course, if the dealer wishes, he may pick up the order himself from the branch warehouse either in the interest of expediting delivery to his customer or saving branch-to-dealer freight expense.

Freight Billing Policy

Dealers pay freight on all shipments. The billing procedure varies with the type of shipment.

<u>On direct factory-to-dealer</u> shipments, the company has been able to centralize the accounts payable function, prepaying freight. This ensures prompt settlement to the carrier. The company bills the dealer for actual freight paid. This ensures the lowest possible cost to the dealer. Prepayment also provides other benefits to dealers in that it permits them to take immediate delivery of the goods at railroad stations either with or without freight agents. Prepayment also permits greater use of stop-off cars since it eliminates the collection of freight charges at the first stop-off point.

Shipments direct from U.S. factories are "collect" to enable Canadian dealers to take advantage of the difference in monetary exchange, i.e., U.S. carrier-originated freight bills include an exchange surcharge, presently of five percent.

<u>On collect shipments</u>, i.e., those from the U.S., the dealer has the option of paying the carrier himself, or forwarding the freight bill to his branch for subsequent invoicing.

This provides the same dealer benefits as prepayment of freight from the factory.

On shipments direct from factory with multiple stop-over points at dealer locations the total actual freight charge is pro-rated to the participating dealers. The pro-rated expense is always lower than the less-than-carload or truckload rate from factory to dealer; actual savings will vary with distance and machinery involved.

On shipments from branch warehouse to dealers MF recovers from the dealer the total factory-to-branch-to-dealer freight charges. In addition, 15 cents per 100 pounds is assessed for expenses incurred by the company in unloading, handling and reloading. The dealer gets the benefit of the carload freight rate to the branch warehouse by the least expensive means of transportation. The dealer can then secure his machinery (1) by picking it up himself (2) at advantageous freight rates after storage-in-transit on carload amounts (3) at advantageous freight rates through shipments consolidated with other dealer orders into carload amounts; these consolidated shipments are stopped-off enroute for partial unloading at the site of

each participating dealer, or (4) by truck shipment from branch to dealer.

Advance Freight Schedule

Factories ship to branches both by rail and truck. Loading patterns of machines are not uniform, e.g., a branch may receive a carload of eight MF135 tractors, a truckload of seven MF135's and a mixed carload of three MF165 and five MF135 tractors. The freight cost on the MF135's by the various means will be different. For these reasons MF issues to its branches an "advance freight schedule" which is used to determine the amount of freight to be recovered from a dealer when shipping from a branch warehouse.

This advance freight schedule indicates the amount of freight to be charged by a branch to a dealer for a particular machine.

This amount is calculated by company traffic specialists by determining:

- the most common mode used to ship the particular machine to each branch;

- the most common loading pattern for the mode established above;

- the average shipping weight of the machine;

- the minimum carload/truckload weight;

- the freight rate based on the last two steps, and then multiplying weight by freight rate from factory to branch.

When shipping to a dealer from a branch warehouse using the storage-in-transit privilege, the advance freight schedule is not used. The dealer in this instance is assessed the actual factory-to-dealer freight cost, plus the storage-in-transit charge assessed by the railway.

Shipments of less-than-carload or less-than-truckload lots from the branch warehouse to a dealer are normally shipped collect. The dealer, however, can request shipment on a prepaid basis and the freight cost will be floor-planned, as explained in Chapter X. Handling charges of 15 cents per 100 pounds are assessed for these shipments.

STORAGE ARRANGEMENTS TO HEIGHTEN DISTRIBUTION EFFICIENCY

As indicated above, the company takes advantage, to the dealer's benefit, of storage-in-transit privileges. They are used extensively at all MF's Canadian warehouses. The company, however, does not have

figures available showing the percentage of wholegoods so routed.

Storage-in-transit takes several forms in the MF distribution system. One is the carload lot of machinery from a factory which has been directed to a branch in the absence of a specific dealer order. When a dealer orders a carload lot of that particular machinery, the branch ships the machinery on to the dealer if the machinery is not available from the factory in time to meet the dealer's desired delivery date.

The dealer pays the factory-to-branch-to-dealer freight charge plus the railroad's storage-in-transit charge. If the shipment in question is a full carload, the dealer gets the benefit of the through rate from the factory-of-origin to his dealership. If the dealer does not require a full carload, the branch often can consolidate less-than-carload lots destined for dealers situated along the same route. This provides all the dealers involved the advantage of stop-off-in-transit rates.

Another form of freight privilege is stop-off-in-transit which permits a carload inbound to a branch to be partially unloaded to replenish the branch's inventory; the balance is then forwarded to a dealer. Or the car could be stopped-off at a dealer first and then moved on the branch (this is a form of split shipment). Of course, the dealer destination must be on the direct line of transit.

Storage-in-transit allows MF branches to "mix" products received from factories and vendors, providing the branch is "in-transit" between the product's origin and its destination. What is in "direct line of transit" and what is not may vary locally and is not easily defined. In general, MF can take advantage of the storage-in-transit privilege when dealing, in terms of any one shipment, with a single railroad and when there is no "doubling back" over the lines of that particular railroad.

Storage-in-transit and split or drop shipments enable branches to consolidate two or more dealer orders into a single carload which is then stopped-off for partial unloading at the participating dealers' locations. This arrangement may work both between factory and branch and between branch and dealerships.

Factory Machinery Banks

MF is enlarging its capacity to store wholegoods at the site of manufacture. This will enable the company to ship more machines directly to the dealer. The storage facilities at North American Tractor Plant (NATP) in Detroit can now hold 4,000 tractors. The combine storage capacity in Brantford is being increased.

The advantages of these machinery banks are several fold: through direct factory-to-dealer shipments, dealers often get lower freight cost on machines which in the past would probably have been stored in

branch warehouses. In their role as reservoirs, factory machine banks enhance the speed of response in filling dealer orders, i.e., the odds that a particular tractor model exists in the NATP tractor bank exceed the chances of its being in the inventory of the branch warehouse serving the dealer who needs it. Machine banks should also reduce the company's amount of inventory, a circumstance of major benefit to the company.

Mixing Warehouses

Related in concept to factory storage facilities are mixing warehouses now being introduced in the United States. Presently installed in Clearfield, Utah and Des Moines, Iowa, the mixing warehouse provides advantages in speed, flexibility and cost. As the concept is further refined, MF will adapt its Canadian distribution system, as applicable, to provide the same type of advantages.

The mixing warehouse provides virtually complete control of the flow of products from factory to dealer; from the time, for instance, a combine receives its final quality control approval in Brantford, until it is delivered to a dealer in Oregon.

To make this "total distribution" concept work calls for thorough coordination and integration of factory warehousing, factory shipping,

traffic, field warehousing and field shipping. In so doing, MF is pursuing one of the more promising sources of cost savings left in the farm machinery business.

In many cases, however, to do so may require that costs be added at one point in the distribution spectrum -- but recovered two-fold, or more, elsewhere. For example, the company has accepted increased costs of packaging at factories in order to achieve greater savings in freight and material handling and field warehousing.

In effect, a mixing warehouse provides a self-adjusting reservoir of machines to fill dealer orders in its region. It is a reservoir with a difference: its day-by-day replenishment has been carefully programmed to meet dealer's needs as precisely as possible. For example, MF's marketing forecasts might show that dealers in a certain mixing warehouse region will need, say, 2,000 plows of specified characteristics over a certain span of months in any given year. Not only will those plows be produced against the anticipated need, but their inventory level at the warehouse will be maintained through semi-automated inventory monitoring procedures. Since carload lots are brought into the warehouse, the dealer further benefits from the direct factory-warehouse-dealer freight rate on carload lots of <u>whatever</u> mixture of machinery he requires.

The basic elements in the decision to test the mixing warehouse concept

were:

- traffic benefits;
- control of inventory level;
- inventory tax benefits;
- improved handling methods made possible by consolidation and volume;
- the nature of the rail systems in the area served;
- the benefits to the dealers in that area.

Traffic benefits include storage-in-transit and transloading of farm machinery from one flatcar to another if the company performs the loading itself. (Transloading, not presently available in Canada, is an expansion of the stop-off-in-transit privilege. It preserves direct-from-factory cost advantages for the dealer and avoids delays through permitting shipments to be transloaded onto as many as four cars, in less-than-carload amounts.)

Coupled with transloading, the total outbound weight in the case of the Clearfield mixing warehouse governs the inbound rate from point of origin to the dealer. This means MF can bring tractors from Detroit,

implements from Des Moines and combines from Brantford in 24,000-pound car lots, and, after a period of storage in the Clearfield warehouse, ship out mixed carloads which might include tractors, implements and combines.

The transloading privilege enables the dealer to get direct shipments of less-than-carload lots (10,000 minimum) based on full carload rates from Clearfield. This privilege allows a full carload, upon arrival at Clearfield, to be broken into as many as four cars, each of which goes directly to the ordering dealer. Through direct branch-to-dealer shipment, the transloading privilege thus eliminates the delays of stop-off-enroute shipment.

The Clearfield installation has allowed the company to eliminate machinery holding points in California, Oregon, Washington and Idaho. By consolidating inventory at one point instead of four, MF has been able to reduce total inventory and improve its inventory turnover rate.

Through the investment of additional capital the company now has much more efficient equipment and facilities at Clearfield than it had before at any of the other four sites. The major cost savings, however, results from the Utah state law. This law levies no personal property taxes against inventory stored in transit for a limited time period and destined for points outside the state.

The Clearfield facility is admirably geared to the operation's technical requirements. Clearfield has 120,000 square feet of inside storage, 15 depressed rail spots, complete with two 10-ton overhead cranes, and three truck docks.

Clearfield relies about 90 percent on rail transportion, primarily because of its location in the western United States and its distance from MF plants. Clearfield can supply the dealers within 72 hours on shipments to California, Oregon, Washington and Idaho on all mainline routes.

The major benefit of the mixing warehouse is to MF dealers and their customers. The mixing and transloading performed at the mixing warehouse enables the dealer to obtain an individual machine in less-than-carload lots and still pay the lower direct-from-factory freight rate by ordering selections of different machines either in carload lots or less-than-carload lots.

DISTRIBUTION EVOLUTION

Over the years, there have been changes in the number of distribution outlets, both wholesale and retail, as indicated in chapter V on marketing. There have also been some changes in the physical equipment,i.e., railroad

cars, trucks and related facilities used to carry MF products to market. (This subject is treated later in this chapter with reference to differences in U.S. and Canadian distribution.) In general, however, with the major exception of mixing warehouses and factory machinery banks, the basic flow of MF goods remains much as it has historically been: direct factory-to-dealer shipment of major wholegoods, i.e., tractors and combines, whenever possible; when not possible, shipment and,perhaps, storage of these goods in branch inventories.

Other similarities also persist. For example, shipments from MF's Canadian factories are virtually 100 percent by rail. In the U.S., due largely to MF tractor transportation requirements from Detroit, the railroad-truck ratio is lower. Approximately 76 percent of tractor shipments from Detroit into Canada are by rail. In the U.S., MF tractor transportation is about 58 percent by rail. The balance, in the case of both countries, is by truck, principally by full truckload.

Smaller machines, however, continue to be shipped mainly in railroad carload lots direct from factory to branch whence dealers may often provide their own transportation. This last, to a lesser degree, is also true of tractors and combines.

With the introduction of mixing warehouses, carload lots of implements and smaller machines will increasingly go to mixing warehouses rather than branches. At mixing warehouses, whenever possible, they will be mixed and transshipped in split carloads for drop shipment to dealers further along the direct line of transit.

With respect to truck transportation, the company makes far less use of trucks in Canada than in the United States. One reason is the design of MF's Canadian plants, built to be served by rail. Another reason is the lack of irregular route carriers across Canada with specialized equipment for hauling agricultural machinery. In the company's opinion, current Canadian highway transport regulations tend to restrict use of truck transport within Canada.

POOLED DISTRIBUTION WITH COMPETITORS

The Royal Commission has asked if MF has "...considered pooling equipment shipments with those of other machinery manufacturers in order to secure either more frequent shipments or better rates." The answer is, Yes, MF has considered such possibilities.

In general, however, there are external and over-riding legal or administrative impediments to pooling shipments, i.e., bills of lading can show only one shipper and one consignee. Similarly, in the event

of loss or damage, determination of fault probably would be far more complicated; additionally, only one party could enter claims for damage, a fact requiring an assignment of interests.

Furthermore, section 32 of the Federal Combines Investigation Act provides that an agreement or arrangement between competitors which lessens competition in respect to markets, customers, channels or methods of distribution, among other things, is unlawful. Such a pooling arrangement could be prohibited under this act.

From a more practical viewpoint, the location of MF production sites do not correspond in such a way with MF's competitors' so as to offer the opportunity to pool product shipments. Although MF combines are assembled across the street from a competitive combine factory, there is no practical advantage in pooling combine shipments since Canadian railroad equipment limitations will not permit more than two combines per car.

VARIATIONS IN NORTH AMERICAN METHODS AND PRACTICES

The following passages comment on the relative advantages and disadvantages between Canada and the U.S. with respect to (1) transportation equipment and/or regulations, and (2) rates.

Transportation Equipment

It is MF's opinion that U.S. railroads have made more progress in the development and introduction of new equipment than Canadian railroads.

The availability of newer equipment in the U.S. -- especially that used in loading operations -- has resulted in transportation cost savings for the U.S. farm machinery industry without counterpart in Canada. Examples are the use of "articulated" railway cars, i.e., two small cars which can be joined and used as one, chain tie-down cars and bi-level cars. Bigger railway cars are available in the U.S. than in Canada. These carry heavier loads and permit lower overall freight rates.

Canadian trucking, in the company's opinion, also lags technically compared to that available in the U.S. Canadian truckers have been slower than their U.S. counterparts to engineer vehicles necessary to handle some types of farm machinery.

The Commission has asked, with reference to the differences between rail and truck transportation, do these differences "affect the design" of farm machinery? MF cannot answer the question in the context of the differences between rail and truck transportation. However, the company can state that transport equipment has not curtailed MF engineering efforts to develop the larger, more powerful machines with greater capacity required by changing farming methods and economics. The company could not allow transportation difficulties to paralyze the necessary evolution of its machines. MF feels the transportation industry must develop the rail and trucking methods the farm machinery industry requires.

The company's transportation requirements are affected by a growing tendency to build up machines to a greater degree than formerly at the factory. In the past, more of the "final assembly" was left to dealer personnel. But today, to meet the farmer's requirements, machines are designed and engineered with closer tolerances and precision which reduces the dealers' ability to assemble them. This means that some machines formerly shipped partially disassembled in box cars are now assembled and shipped on flat cars, e.g., drills and planters.

Damage free box cars, known as "DFs" are desirable for the shipment of smaller machines such as harrows and plows. Unfortunately, in Canada, DFs are not regularly available as they are in the U.S. In Canada, also, there is a special "user" charge for DFs, a charge not levied in the U.S. Similarly, chain tie-down equipment, available in the U.S., is not available from Canadian railroads.

Rates

Compounding the disadvantages inherent in MF's use of Canadian transportation facilities from the physical and regulatory standpoint, are the absolute rate disadvantages in themselves.

These rate differentials combine with distances to place MF at a transportation cost disadvantage in 86 percent of the North American farm machinery market, as shown by the map already presented.

Distressingly enough, the transportation cost disadvantage to the Canadian manufacturer attempting to market his products in western Canada, compared to his U.S. competition, appears to be increasing.

The Woods-Gordon study in 1956 labeled western Canada as an area of transportation cost advantage to the Canadian farm machinery industry. MF's own studies, based on rates in effect February 1, 1967, cause the company to believe that these conditions have changed.

(Note: as of this writing, freight rates are in a state of flux. New higher rates -- not reflected in the subsequent tables -- have recently been introduced in Canada. These new, higher Canadian rates are not shown in the tables because the company anticipates the momentary establishment of new and higher rates in the United States which will probably counterpart the Canadian increases, thereby essentially maintaining the historical discrepancy. Thus, the rate data contained in this chapter, while not entirely up-to-date, (1) do validly present an accurate historical picture, and (2) probably present a less distorted picture of how rates in the two countries will compare after the introduction of the new U.S. rates than if the tables showed new Canadian rates and shortly-to-be-changed U.S. rates. The dollar figures used are Canadian dollars when the mileages in question are entirely within Canada; dollar figures are U.S. when the mileages in question are (1) entirely within the U.S., or (2) a combination of mileage between the two countries.)

It is the MF estimate that its manufacturing sites in Canada are now at a

disadvantage throughout western Canada compared to the geographic centre of the farm machinery industry in the U.S., i.e., the Moline, Illinois/Davenport, Iowa area.

According to MF's calculations, those manufacturers in the U.S. midwest have a freight advantage in all of western Canada and eastward as far as a line connecting Atikokan and Flanders, Ontario.

It should be emphasized that, in general, MF's disadvantage has not been static: it has steadily grown worse, e.g. freight expenses from the Toronto-Brantford area in 1951 compared to February 1967. In 1951, it cost 291 cents a hundred pounds to ship MF agricultural implements from Toronto to Edmonton. Competition in the Moline, Illinois area had to pay 321 cents a hundred pounds to the same destination.

In February 1967, the freight rate on MF implements was 368 cents a hundred pounds (minimum weight 24,000 pounds and over) compared to 315 cents a hundred weight for the competitor's machines (24,000 minimum).

Two conclusions are evident: (1) the MF freight rate had increased slightly more than 26 percent while its competitor's rate had decreased about two percent, and (2) MF had fallen from a cost advantage of 30 cents

on a hundred weight on loadings of 24,000 pounds to a cost disadvantage of 53 cents a hundred weight.

With regard to higher weight loadings, MF's cost disadvantage was even more pronounced. For example, on a 50,000-pound load of implements the MF Brantford-to-Edmonton disadvantage was 99 cents a hundred weight because the competition enjoyed a 269 cent per hundred weight rate on loads of 50,000 pounds and over.

The following table compares freight costs per-ton-mile on shipments of agricultural machinery in the territory surrounding Brantford, Ontario with shipments in the territory surrounding Des Moines, Iowa based on rates in effect February 1, 1967.

Comparison of Ton-Mile Costs of Farm Machinery

Railway Shipment: Canada and U.S.

Mileage	Within Canada from Brantford, Ont. — Cents per 100 lbs.	Within Canada from Brantford, Ont. — Cents per ton-mile	Within United States from Des Moines, Iowa — Cents per 100 lbs.	Within United States from Des Moines, Iowa — Cents per ton-mile	Disadvantage Within Canada — $-per-ton
300	90	6.00	76	5.06	2.80
700	160	4.57	118	3.37	9.20
1000	176	3.52	145	2.90	6.20
1500	272	3.63	187	2.49	17.00
2000	359	3.59	229	2.29	26.00

Rate Data Sources

- Canada: Mileage 300 - 700 miles
  Rates published in Canadian National Railways
  Tariff Number C.N. Rys., No. C-100

  Mileage over 700 miles
  Rates published in Canadian Freight Association
  Freight Tariff 4-C Number C T C (F) 1534

- U.S.: Mileage 300 - 2000 miles
  Rates published in Western Trunk Lines
  Freight Tariffs W-2000-I and W-1000
  I C C Numbers A-4586 and A-3929 respectively

U.S. rates are based on minimum weight of 40,000 pounds. Canadian rates in the 20-40,000-pound range do not diminish.

The following table compares the rates in effect February 1, 1967 between Brantford and Winnipeg, Saskatoon and Edmonton, with the rates for Moline, Illinois to the same destinations.

Comparative Rail Freight Rates*

Note: Rates are shown in cents-per-100 pounds

From	To	20,000 lbs. minimum	30,000 lbs. minimum	40,000 lbs. minimum	50,000 lbs. + minimum
Brantford	Winnipeg	230	230	230	230
Moline	Winnipeg	199	190	180	149
Competitor Advantage		31	40	50	81
Brantford	Saskatoon	309	309	309	309
Moline	Saskatoon	270	248	226	213
Competitor Advantage		39	61	83	96
Brantford	Edmonton	368	368	368	368
Moline	Edmonton	326	304	282	269
Competitor Advantage		42	64	86	99

* effective March 1, 1964

\+ 50,000 lbs. minimum rate effective June 10, 1965

The following table, based on rates in effect February 1, 1967, shows the dollar advantage competitors enjoyed over MF on their combine shipments from the U.S. midwest to Winnipeg, Saskatoon and Edmonton.

Comparison of Freight Expense

per 10,000 Pound Combine

From	To	Cents per 100 pounds*	Dollars per Combine
Brantford	Winnipeg	230	230
Moline	Winnipeg	199	199
Competitor Advantage			31
Brantford	Saskatoon	309	309
Moline	Saskatoon	270	270
Competitor Advantage			39
Brantford	Edmonton	368	368
Moline	Edmonton	326	326
Competitor Advantage			42

* Based on minimum total shipment weight of 20,000 pounds.

EFFORTS TO SECURE BETTER RATES IN CANADA

The Royal Commission has asked: "What efforts have you made to secure better rates in Canada?" The following paragraphs explain MF's efforts and their results in this regard in recent years.

Rates to Vancouver

In 1959 MF applied to the Canadian Freight Association (CFA) for publication of rates to Vancouver from eastern Canadian points on the same basis as those published to U.S. Pacific coast points.

In March 1959 the CFA advised that the Trans-Continental Committee was not prepared to recommend that the request be granted.

Massey-Ferguson was told that the intent of rates established from eastern Canada to U.S. destinations was to maintain the competitive situation of the Canadian manufacturer with that of the eastern United States manufacturer and that the element of competition which necessitated rates from eastern United States points was not comparable.

In April 1959 MF requested that further consideration be given to its proposal. MF pointed out that under the existing tariffs, Toronto-to-Vancouver rates were higher than Buffalo-to-Vancouver rates.

In December 1959 the CFA adjusted the rates, but at a level higher than the company had requested. After further correspondence, MF was informed

in March 1960 that the rates would be amended to the levels the company had originally requested.

Mixed Carloads

In June 1962 MF requested the CFA to remove from their tariffs the stipulation that the billed weight of agricultural implements must be 15,000 pounds or more to permit the inclusion of certain types of agricultural implement parts. MF was informed in August 1962 that its proposal had been accepted.

Incentive Rates

In December 1962 MF made a presentation to Canadian carriers proposing the establishment of incentive rates, i.e., lower rates for heavier loadings per car, within Canada.

At a hearing before the Canadian Freight Association (eastern lines) in March 1963 MF pointed out that it was endeavoring to load heavier on shipments to the United States to take advantage of the lower incentive rates in effect in the U.S.

The company explained it had built a superstructure costing $75 per car to permit the loading of three large MF combines for shipment to the U.S. west coast in order to obtain the 30,000 lbs. minimum weight rate obtainable in the U.S. In Canada, as mentioned earlier, the same combines were shipped two per car. On shipments of implements such as

cultivators, plows, harrows, etc., loadings of 40,000 lbs. a car were possible. United States rail carriers were supplying specially equipped cars to the U.S. farm machinery industry to encourage heavier loadings. These competitors also enjoyed the advantage of incentive rates to border points on shipments to Canada.

Massey-Ferguson pointed out that acceptance of the proposal would enhance its competitive position and increase its potential in the Canadian market, a circumstance which would also benefit Canadian railroads.

In September 1963 the Canadian Freight Association (eastern lines) informed MF that MF's application would not be granted on the grounds that cars were then being loaded above the minimum weight and that, in the CFA's opinion, establishing reduced rates subject to a higher minimum weight would not increase overall Canadian rail movement. The proposal, if accepted, would diminish net railway revenue, it was said.

Storage-in-Transit

In March 1963 Massey-Ferguson requested the CFA to amend Canadian National Railway and Canadian Pacific Railway tariffs to provide for storage-in-transit on farm machinery and parts and to include as points of origin the company's factories at Toronto, Brantford and Woodstock.

The freight committee of the CFA approved the MF request and in April 1963 the tariffs were amended accordingly. All Canadian branch warehouses were covered by this application.

Minimum Parts Weight Reduction

In February 1964 MF requested that the minimum weight restriction on implement and tractor engine parts be reduced from 30,000 to 24,000 pounds on shipments to western Canada. In June 1964 the CFA (western lines) declined the proposal. After vigorous objection by the company, the proposal was reconsidered and accepted later the same month.

Agreed Charges to Brantford

Massey-Ferguson negotiated with the railways for the establishment of an agreed charge on internal combustion engines from Walkerville, Ontario, to Brantford, Ontario.

The tariff was published effective March 11, 1964. The company also applied for comparative freight rates on engines from St. Catharines, Ontario to Brantford, Ontario, in specially equipped cars. This application was also approved.

Rates on Imported Items

Special import competitive rates were published on tractor components from the Canadian ports of Halifax and St. John to Detroit, Michigan.

These special rates were for components shipped in metal containers. MF was not able to perfect a method of loading MF equipment in such containers. The company applied to have the same rate applied to the wooden cases in which its components are shipped and which can also be handled by mechanical fork-lift trucks, as are metal containers.

The application was turned down even though MF pointed out that it is possible to ship these components through the port of New York, New York and obtain piggy-back rates which are somewhat lower than the regular imports from St. John and Halifax. At the present time, there is no comparable piggy-back service from these ports to Detroit, Michigan.

EFFORTS TO SECURE BETTER RATES IN THE U.S.

Practically all MF efforts to secure better freight rates in the United States are channelled through the traffic committee of the Farm and Industrial Equipment Institute (FIEI). This institute includes the major manufacturers of farm machinery in the United States.

Members' applications for changes in rates, commodity ratings, minimum weight restrictions, etc., are proposed through this organization.

Individual action is taken by members of the FIEI when a specific

proposal has limited application to the industry. For example, in May 1965 MF requested that a storage-in-transit and transloading privilege on agricultural implements be extended to include Clearfield, Utah. This proposal was approved by the appropriate rate authorities.

Proposals Regarding Des Moines, Iowa

In 1966, the company opened an implement assembly plant in Des Moines, Iowa. At MF request, certain rail carriers filed proposals with the various appropriate rate jurisdictions to reduce existing freight rates on inbound commodities to, and outbound commodities from, Des Moines. The following actions were accomplished:

Inbound shipments:

- plant removal rates were established;

- application for reduced rates on components shipped from Canadian factories to Des Moines, based on higher incentive minima, was submitted.

Outbound shipments:

- storage-in-transit was approved by all carriers;

- application for a transloading arrangement at Des Moines was filed by the Chicago Great Western Railroad.

Others have now joined the application.

- proposal made to rate jurisdiction authorities to include Des Moines in tariff with lower proportional rates from Des Moines to Canada.

FREIGHT RATE OUTLOOK

Canada

The National Transportation Act received Royal Assent on February 9, 1967, and the several parts of the act come into force upon proclamation of the Governor in Council.

The act provides for the establishment of the Canadian Transport Commission which will administer and control the operations of all carriers engaged in transport by railway, water, aircraft, extra-provincial motor vehicle transport and commodity pipelines. The act will allow railways more freedom in the handling of rate matters, i.e.,to increase or decrease existing rates.

Part V of the act, relating to "railways, telegraphs and telephones", was proclaimed in force on March 23, 1967.

Part V, among other things, has entirely eliminated the "bridge subsidy". This elimination may well eventuate in increased freight rates between eastern and western Canada and thus place MF at a

further disadvantage in comparison with midwest U.S. manufacturers.

United States

In the United States, as shown earlier, incentive rail rates are now in effect for 20,000 lbs., 24,000 lbs., 30,000 lbs., and 40,000 lbs., minimum weights. In specified territories, minimum weight provisions have been extended to 50,000 lbs., and it appears that this approach will be adopted throughout the U.S.

Railroads are also developing proposals to provide rates on minimal loadings of 60,000 and 80,000 lbs. These rates would apply to the very heavy types of farm machinery, presently transported either by rail or truck. The incentive rail rates are intended to stop further erosion of rail freight to truck.

COST IMPACT OF TRANSPORTATION CHARGES

The following tables show the relationship of (1) inbound freight charges to cost of the material shipped, and (2) total freight charges to the company's net sales.

Inbound Freight Expenses: Production Materials (fiscal 1964)

Canadian Factories

(thousands of dollars)

	Toronto Works	Combine Plant	Verity/Woodstock	M.Foundry
Freight Charge	$ 573.2	$ 487.3	$ 251.3	$ 11.5
on				
Purchases of	$28,667.8	$25,135.1	$14,609.9	$1,920.8
Freight as a % of Purchase	1.99	1.94	1.72	5.99

U.S. Factories

	North American Tractor Plant	Transmission and Axle Plant
Freight Charge	$ 737.7	$ 159.8
on		
Purchases of	$53,566.2	$6,589.0
Freight as a % of Purchase	1.38	2.43

These inbound freight items include new and sundry materials, purchased parts and hardware, and interworks shipments between MF's North American and overseas plants. The differences in the percentages shown above for MF's various North American factories are due to differences in the sourcing location and the type of material. Certain raw materials are of heavy weight and low value, other products of light weight are of high value.

In 1965, standard incoming freight for products manufactured in the company's Canadian factories was 1.3 percent of total standard costs. For products produced jointly in Canadian and U.S. factories, the figure was 1.4 percent.

For interplant transportation of components and vendor-purchased items in Canada, MF has instituted its own trucking fleet. This has been largely responsible for controlling the inbound freight costs reflected above. MF's overall use of all trucking has increased over the years. The trend seems to be toward more trucking over the shorter distances. Trucks are easier to load, provide more flexible routing, require less dunnage and labor and, MF believes, their use results in fewer damage claims.

The following table shows total product freight charges as a percentage of net sales, i.e., wholesale sales in North America. The table includes freight charges on inbound materials, interplant shipments and finished products.

Total Freight in Relation to Net Sales: 1957 - 1966

Year	Total Freight Charges (Inbound and Outbound	Total Net Sales	Freight Charges as a Percentage of Net Sales
1957	7,192,000	130,974,000	5.49
1958	10,627,787	170,621,000	6.23
1959	12,747,379	217,651,000	5.86
1960	9,987,100	202,522,000	4.93
1961	8,570,900	190,966,000	4.49
1962	9,492,000	211,475,000	4.49
1963	11,477,300	235,758,000	4.87
1964	12,527,000	276,140,000	4.54
1965	14,066,000	310,571,000	4.53
1966	15,045,000	369,303,000	4.07

* * *

In summary, this chapter shows that transportation rates place Massey-Ferguson at a disadvantage vis-a-vis its competitors. MF, in fact, is disadvantaged in 86 percent of the North American farm machinery market. This circumstance is partially due to physical distances. Equally significant, MF is disadvantaged, even in Canada, by Canadian rail rates which are higher than the rates U.S. competitors pay in moving their goods to the Canadian market over rail beds which lie primarily in the U.S.

The question remains of the effect of MF's transportation disadvantage in possible adjustments in the location of Massey-Ferguson manufacturing sites. The question of plant relocations has been examined in chapter IV on manufacturing. It shall suffice here to say that future plant location or relocation would be carefully weighed in terms of the then-available information regarding total projected production costs, i.e., labor and material costs, in addition to transportation costs.

Massey-Ferguson, regardless of where it is operating, will continue to explore and implement every feasible distribution procedure to achieve more cost savings. The company believes that the farmer who pays the freight -- directly on outbound shipments, indirectly on inbound shipments -- would be well advised to share MF's interest in achieving equitable resolution of existing Canadian freight rates. If he did, the benefits might well extend to many other purchases upon which he also pays the freight.

Chapter VIII

PARTS

Massey-Ferguson's practice of selling repair parts to independent dealers began in 1944 when the dealer purchase agreement replaced the former consignment contract. Up to that time, the company sold its parts and wholegoods through agents, basically order takers for the company, located in virtually every village throughout Canada, e.g., there were 2,296 such agents in 1935.

The tasks of making collections and providing service at the retail level were performed by company representatives based at the branch offices and field distribution points.

This system became unwieldy and prohibitively expensive as MF's volume of business expanded. In 1944, there were 17 branch offices in Canada, some employing up to 70 men on retail service and collections alone, and there were more than 1,900 Massey agents compared to about 700 dealers today.

PRESENT PRACTICE AND ITS EVOLUTION

With the introduction of the dealer sales agreement, dealers assumed much of the responsibility for all aspects of retail service, and the company was able to effect significant economies by consolidating its

field organization. After 1944, the function of the branch office largely became the one of developing better dealers and providing them with the support necessary to supply goods and services to their customers.

Improvements in transportation and communication facilities in rural Canada gradually reduced the need for closely spaced dealerships. The results have been fewer, but better qualified, dealers with larger geographical areas of responsibility for sales and service, serving larger but fewer farmers. The trend toward fewer dealers, of greater individual size and financial strength -- who can handle larger parts inventories -- is common throughout the North American industry.

In Canada today, the company stocks parts at its branches in Calgary, Saskatoon, Winnipeg, Toronto, and Montreal and at warehouses in Edmonton, Regina, London and Moncton. In addition, a warehousing operation is located at Yorkton, primarily for the distribution of wholegoods. These locations, in turn, are supplied from the Canadian master parts depot in Brantford.

Parts inventory and records for all North America are maintained in Racine, Wisconsin, at MF's continental master parts depot and computer control centre known as the North American Parts Operation (NAPO). In the United States, Massey-Ferguson supplies dealers from 12 field warehouses plus NAPO and a master parts depot for MF's Fowler western implement operation in California.

Parts Inventory Growth and Turnover

Over the years, the number of different types of parts (called "parts numbers") stocked has increased from approximately 68,000 in 1958 to 98,779 last fall. Today, there are more than 100,000. Approximately 75 to 80 percent of these are used in Canada. Improved machines and expansion of the product line account for the increase.

Parts stocked in MF's Canadian field warehouses and the Brantford depot as of October 31, 1966 were valued at $5.8 million. This figure does not include parts in dealer inventories. Turnover rate of the parts inventory in Canada for the 12 months preceding October 31, 1966 was .82. Expressed another way, about a 14 months' supply of parts was on hand in MF's Canadian warehouses on that date.

Parts Stock in Canada: Numbers and Value
(October 31, 1966)

Location	Number of "Parts Numbers" Stocked	Value of Inventory
Calgary	34,984	$ 498,540
Edmonton	35,539	488,322
London	31,076	309,238
Moncton	17,323	151,807
Montreal	30,879	370,727
Regina	29,594	473,178
Saskatoon	32,687	633,575
Toronto	33,841	390,181
Winnipeg	31,555	390,366
Sub Total Branches	--	3,705,934
Brantford Warehouse	39,422	2,074,530
Total Canada	--	Can. $5,780,464

Policy on Long-Term Stock Maintenance

Company policy on length of retention of parts in inventory exceeds all known legal requirements in every province. Tractor and combine parts are stocked for a minimum of 15 years after the company has stopped manufacturing a machine. Baler parts are stocked for 12 years and parts for other machines for 10 years. These, however, are minimum figures only. In practice MF parts are supplied as long as there is a reasonable requirement for them. Parts are still available for several machines which have been out of production for over 20 years. This long-term stocking of parts results in many items being almost static.

What Happens in One Year

The following fold-out is an analysis of MF's parts inventory during fiscal year 1966. Of 98,779 parts numbers in stock on October 31, 1966, the end of MF's fiscal year, 30,007 had had no North American sales during the previous 12 months. Of the next 27,979 different kinds of parts, only one to nine of each kind had been sold for a total of approximately 99,000 separate pieces.

The same table shows that:

- 86.1 percent of the dollar inventory, i.e., those parts with fewer than 5,000 sales each, produced only 74.8 percent of sales dollar volume;

- 84 percent of the 98,779 different kinds of parts, i.e.,

North American Parts Inventory Analysis - Fiscal Year 1966

													VIII TOTALS
NUMBER OF INDIVIDUAL PARTS:	30,007	27,979	11,177	7,219	3,738	2,360	7,407	2,527	2,471	2,353	636	925	98,779
- of which each had annual sales of from ___ to ___ during year ending 10/31/66	0	1-9	10-24	25-49	50-74	75-99	100 - 299	300 - 499	500 - 999	1000 - 2,999	3000 - 4999	5000 or more	not appli-cable
- and which accounted for total separate piece sales of*	0	99	175	254	228	203	1,292	974	1,754	4,013	2479	20,516	31,987
- and which equalled ___% of total annual dollar sales	0	2.2	3.0	3.5	2.9	2.8	13.0	8.4	11.5	18.6	8.9	25.2	22.6MM
- and which accounted for ___% of inventory dollar value	5.6	10.7	7.9	7.3	4.5	3.6	13.9	7.3	8.8	11.6	4.9	13.9	23.0MM
- and which had an annual inventory dollar turnover of	0	.21	.37	.48	.65	.76	.92	1.12	1.29	1.58	1.77	1.77	.98

* 000's omitted

those with sales of fewer than 100 pieces, accounted for only 959,000, or three percent, of the 31,987,000 pieces sold;

- while generating only 14.4 percent of dollar sales, parts with fewer than 100 sales constituted a disproportionate 36.9 percent of the dollar value of the inventory.

In these ways, and others, the company incurs high inventory maintenance costs in order to ensure parts availability for the farmer.

"Lifetime Builds"

"Lifetime builds" of parts, i.e., a large quantity of a single part manufactured at one time and intended to last throughout the entire lifetime of some machine, also increase inventory maintenance costs because many such parts will be in storage 15 to 20 years or more before there is much demand for them. At the end of October, 1966, MF had $1.5 million tied up in "lifetime builds" in the North American inventory. This "lifetime build" inventory, of course, is in addition to the regular stock inventory.

Centralized Inventory Control

Massey-Ferguson was the first company in the industry to introduce centralized control of its total farm machinery parts operation. The North American Parts Operation came into being in 1958 after company studies suggested that centralized parts control with a staff of supply

and distribution specialists would significantly improve parts service. Previously each branch had independently, and often inexpertly, determined the level of stock required to supply local dealers and then ordered at its own discretion.

The choice of Racine as the site for NAPO was dictated by the city's location near the heart of the continent's chief agricultural area and its location near suppliers and efficient transportation facilities. A further consideration was that MF owned a suitable property in Racine which at one time had been the headquarters of the company's U.S. operations.

Computerization

Initially, NAPO processed stock level and sales information manually. Then, in 1959, a mechanized system using an IBM 650 computer was introduced. Three years later NAPO installed an IBM 1401 and a more refined inventory control system which took into account optimum stocking requirements, distances from warehouses, seasonal fluctuations and also allowed for the application of judgment to meet emergency situations. The 1401 enhanced the company's ability to perform continuing parts inventory and sales analysis.

In 1966, MF installed an IBM 360 computer to further increase the capacity and versatility of the centralized inventory control system. The computer keeps a continuously updated record of all parts based on

daily sales reports from all branches; it automatically processes replenishment orders to MF factories and shipping instructions for outside suppliers.

During 1967, a random access capability is being added together with a visual display unit --much like the TV screens showing arrivals and departures in air terminals --for shipping/receiving data. This means that the computer will be able to indicate instantly where any specific part is stored in North America.

The parts inventory control/distribution system is under constant review. Advances in control methods, distribution and computer systems are incorporated as they become feasible.

Staff Specialization

In addition to the processing speed provided by the NAPO computer, other benefits accrue from centralized inventory control. For example, each category or sub-category of parts is controlled by a specialist, known as an inventory planner. He is responsible for procuring his category of parts well in advance of sales demand. Supporting the inventory planner are specifications analysts who develop parts inventory requirements for new machines and then oversee that inventory for three years following machine introduction. The specifications analysts project part use-rates based on experience of similar parts in similar machines. Parts are then ordered and distributed to depots and field warehouses before the new machine in question is sold.

Branch Parts Stocks

A part is stocked at a branch if there is a history of at least three sales a year for that part from that location. Basic functional parts such as engine components are stocked for an even lower frequency of sales.

Complete data on sales by branches to dealers are forwarded daily to Racine and fed into the computer. The machine then calculates quantities of parts required to maintain branch stocks at optimum levels.

Listing of parts inventories at all warehouses are distributed quarterly to branches. This service, coupled with a telex network linking all North American branches and parts depots, enables branches to supply each others' dealers in emergencies.

How Dealers Obtain Parts

Massey-Ferguson's parts ordering programs, administered by the marketing planning section at NAPO, help dealers use their resources to maximum advantage in meeting their customers' parts requirements.

Each winter, MF conducts a master stock order program under which dealers may replenish their inventories of fast moving parts well in advance of their season of use. The program features discounts, extended terms of payment and prepaid freight by the company.

A harvest or fall stock order program, introduced in 1959 and repeated

annualy, offers incentives similar to the master stock order, but is timed to encourage dealers to stock parts prior to the harvest season in their areas. Items ordered under either of these programs are usually shipped from 3 to 15 days after receipt of the order.

A monthly stock order program offering prepaid freight was also initiated in 1959. Its main purpose was to encourage dealers to order regularly. Regular monthly ordering reduced the number of emergency orders. Emergency orders, of course, are costly in terms of extra telephone/telegraph expenses and premium freight rates. As a result of enthusiastic dealer response to the monthly stock order, it has been increased to a bi-weekly basis. These orders are shipped within one or two days of ordering.

Extended payment terms and prepaid freight are available to dealers on purchases of parts for machines being introduced in the market. To guide the dealer in placing his order, he is supplied with listings of new machine part numbers and suggested levels of inventory, as developed by parts analysts.

Special parts order programs also cover new parts which generally fall into an accessory or hardware category the dealer offers his customers as a convenience. Arrangements are also available for initial stock orders for new dealers.

Besides these order programs there are interim orders falling between the bi-weekly orders. In other words, a dealer can order any time he

wishes. He is not restricted to ordering through the special programs just mentioned. These interim orders are either daily (routine) or emergency orders. The emergency ordering system is discussed later in this chapter.

Parts Return Policy

Massey-Ferguson offers its dealers a number of parts return programs which are of considerable financial advantage to the dealer. Even more important is the fact that all these parts return programs are designed to encourage the dealer to maintain a properly constituted inventory at the optimum level to enable him to give his customers fast replacement parts service.

As might be expected, the dealer can return any order shipped through company error at no expense to himself. Any order that he places in error may be returned within 30 days at no penalty to him except the freight charges.

On parts orders for newly introduced machines, the dealer may return parts at no penalty for 30 months. These are, of course, parts with which there is no previous sales experience to govern quantities ordered. In effect, the company assumes all risks in the interest of assuring the farmer fast repair parts service.

Two major elements of the overall MF parts return program are the annual return programs, each conducted as soon as possible after October 31, the

end of the company's fiscal year. The first of these is unique in the farm machinery industry.

It enables the dealer to return surplus, slow-moving or inactive parts for 50 percent of the dealer billing price shown in the parts price list in effect on October 31. These are parts which the dealer and the company have little chance of selling. Often, the company has to scrap them. The discounted repurchase price offsets stock order discounts, cash discounts, price advances and company handling expenses.

Incentive to Improve Stock Inventory Management

In practice, however, the dealer who effectively manages his inventory to meet changing customer demand can avoid the 50 percent discount. Each year, as soon as possible after October 31, the company publishes a special parts list. This list shows relatively fast moving parts, which the company will repurchase for 85 percent of the dealer billing price. Again, the price differential goes to defray order and cash discounts, price advances and the company's handling expense. The dealer who is properly managing his parts inventory will be able to return parts he cannot move under this latter plan. To do so, he must monitor his inventory in relationship to his customers' parts demands. To encourage him to do so, the dealer is limited to returning five percent of his total parts purchases during the previous fiscal year.

The overall effect of both these annual repurchase plans is to keep dealerships stocked with parts which are actually needed by farmers

in the area.

In the event of dealer termination, the company repurchases the dealer's MF parts which are new, unused and undamaged after deducting all discounts and reductions allowed, at 85 percent of the purchase price. This practice basically conforms to the only legislation in North America, i.e., North Dakota, regulating such matters. Indeed, MF parts repurchase policy, which pre-dated the legislation, required no revision to satisfy the law.

Educational, Reference and Promotional Material

The parts assistance MF renders dealers includes informational and promotional tools. One such device, useful to both the dealer and the retail customer, are data books containing cross-referenced information on certain MF and competitor part numbers. MF's data books cover batteries, bearings, filters, oil seals and spark plugs, i.e., high volume, competitive parts. These data books enable a dealer to identify for the owner of a competitive machine those MF parts which would be required to service his machine. A sample of a section dealing with spark plugs appears below.

Another dealer/customer aid is the Speedy Parts Reference Book, first published in 1964, which facilitates fast, accurate identification of parts numbers and also notes the multiple applications of many items.

Many other publications are distributed to dealers. Among them are booklets containing exploded illustrations of machines showing each part and its relationship to others (see the third following page); a booklet which outlines company-recommended parts; a purchase control record system; regular sales bulletins informing dealers of new products, procedures and merchandising programs; in-store product promotion displays; suggested print advertising layouts; and spot radio announcements.

Improvement of Facilities

MF also assists dealers in up-grading their parts retailing and service facilities. For example, many competitive parts outlets have successfully adapted the visual display/self-service techniques of the supermarket.

To help dealers meet this competition, MF makes available a detailed store planning program applying the self-service concept. The company also provides financial assistance to dealers wishing to take advantage of the program. Along with self-service goes a wide selection of goods. A few of the products added recently are batteries, coolants, hand cleaners, paints and an expanded series of repair part kits for the farmer who chooses to make machinery repairs himself.

MF NUMBERING SYSTEM

The 5th, 6th and 7th numbers of every Massey-Ferguson Spark Plug number have separate meanings:

1 027 000 M91

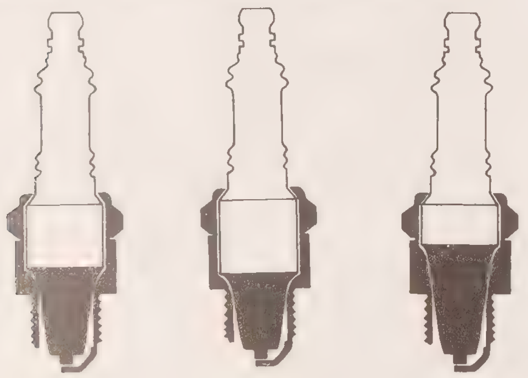
These three digits appear on the spark plug. Here's what these three digits mean:

1. First digit designates thread size.
2. Second digit designates plug reach and special types such as 0 for tapered seat and 9 for commercials.
3. Third digit designates relative heat range (number 1 is coldest).
4. (E) means Extended core type. *Important:* Use extended core plugs in overhead valve engines only!

MF TORQUE CHART

Thread Size	Recommended Torque	
	Cast Iron Heads	Aluminum Heads
14MM	30 Ft. Lbs.	20-25 Ft. Lbs.
18MM Tapered Seat	15 Ft. Lbs.	15 Ft. Lbs.
18MM	50 Ft. Lbs.	35 Ft. Lbs.

HEAT RANGE PRINCIPLE



Normal

Medium length insulator nose transfers heat at normal speed, producing normal plug.

Cold

Short insulator nose transfers heat rapidly from firing tip, producing cold plug.

Hot

Long insulator nose transfers heat slowly from the firing tip, producing hot plug.

USE COLDER SPARK PLUGS ... to correct electrode burning or pre-ignition resulting from sustained high speeds, long upgrades, heavy loads or other conditions which cause abnormally high combustion chamber temperatures.

USE HOTTER SPARK PLUGS ... to correct fuel fouling resulting from prolonged idling, light loads, start-stop driving or other conditions which cause abnormally low combustion chamber temperatures.

HEAT RANGE INFORMATION

Massey-Ferguson Spark Plugs are supplied in various heat ranges in each size to handle the requirements of individual engine and operating conditions.

The heat range chart lists the various plug sizes and the numbered plugs in order of heat range (cold to hot) in each size.

When analysis of the removed plugs indicates the need for either a "colder" or "hotter" type, the proper plug may be selected by referring to the Heat Range Chart.

Example: MF Spark Plug 435(E) is the next "hotter" plug of the same type to the 433(E). The 431(E) is the next "colder" plug of the same type.
The 436 is the next "hotter" plug of the same type to the 434, and the 430 is the next "colder" plug of the same type.

(E) Extended Core Type.

Heat Range Cross Reference Chart

Thread Size & Reach	Hex. Size	Heat Range	Massey Ferguson Types	TO REPLACE		
				Champion	AC	Auto-lite
14MM 3/8" Reach	13/16"	Cold	431(E)	J9Y J10Y	42S	A32 AR32
			430	J6 UJ6	43 C43	A3,AT3 AR31
			432	J7	44 C44	A5,AT4 AR51
			433(E)	J12Y	44S 45S	A42 AR42
			434	J8 UJ8	45 C45	A7 AT6
			435(E)	J18Y	46S	A52 AR52
		Hot	436	J11	46 C46	A9,AT8 AR8
14MM 7/16" Reach	13/16"	Norm	442	H10	45L-Com C45L	AL7 ARL8
		Hot	443	H11	45L	AL9
14MM 1/2" Reach	13/16"	Norm	452	L10 UL15Y	45FF 46FF	AE42 AE6
14MM 3/4" Reach	13/16"	Cold	461	N5,N6 UN12Y	43N-46N	AG4 AG5
		Norm	462(E)	N14Y	45XLS	AG42
18MM Tapered Seat	13/16"	Cold	803(E)	F11Y	84TS	BF42 BRF42
			804	870 860	85T,84T C84T	BTF6 BF7
		Hot	805(E)	F14Y	85TS	BF82 BF92
18MM	7/8"	Cold	894	5-Com D9,D10, D14	C85, TC85 TC83, 82-Com C82,C83	BT3 BT4 BT6
			896	D16 UD16	C86 TC86 86-Com	BT8 BR8
		Hot	898	9,D21 D23	C87,88 C88L 88L-Com	BT9 BT10 B11
MF SMALL ENGINE TYPE FOR POWER MOWERS, 2 CYCLE ENGINES						
14MM 3/8" Reach	13/16"	Norm	400	J17LM J8J	M45 LM45	A7X

MASSEY-FERGUSON SPARK PLUGS

FARM TRACTORS

(Set all spark plug gaps .025" unless otherwise shown)

USE A COLDER TYPE when changing fuel from gasoline to propane or butane.
USE A HOTTER TYPE when changing fuel from gasoline to kerosene or a distillate.

Model	MF No.
JACQUES-FRAZER	1027 896 M91
JOHN DEERE	
(All gaps .030")	
A, AH, AI, AN, ANH, AO, AR, AW, AWH; B, BN, BW, BNH,BWH; G, GH, GN, GW, H,HN, HNH, HWH; 50, 60, 70, 520, 620, 720, 530, 630, 730,	
18 mm (gasoline&distillate, Light)	1027 898 M91
Normal & Heavy	1027 896 M91
(L P G)	1027 894 M91
L, LA, LI, M, MC, MT, 40, 320 Series, 330 Series 14 mm Hds. (Gap .025")	
(Gasoline)	1027 442 M91
(Distillate)	1027 436 M91
R (Gasoline starting eng.)	1027 896 M91
Model 70D, 80, 720D, 730D, 820, 830, 840 (Gasoline starting engs.)	1027 434 M91
Model; 420, 430, 440 Series (Gap .025") (Gasoline)	
(L P G)	1027 442 M91
(Distillate)	1027 443 M91
1010, 2010 Series Gasoline	1027 442 M91
L.P.G. (Gap .015"-.018")	1027 442 M91
3010, 4010 Gasoline (Gap .030")	1027 896 M91
L.P.G. (Gap .025")	1027 894 M91
JUMBO	
Gasoline	1027 432 M91
Kerosene	1027 436 M91
LAUSON	
LB	1027 896 M91
RLC, RSC, RC, TLC	1027 432 M91
RAY, LA, LF, LFR.	1027 896 M91
LEADER	
14 mm Hds.	1027 434 M91
LE ROI Mi-Mower	
K.-Tractor	1027 896 M91
Model 105 Tractair (Gap .030")	1027 436 M91
Other 14 mm Hds.	1027 432 M91
LINN using:	
Buda, 6MO-970; Wauk, 6RB, 6AB	1027 896 M91
LONG	1027 896 M91
LOVE	1027 434 M91
MAJOR (See Fordson)	
MASSEY-FERGUSON (Massey-Harris)	
Gas & Kerosene	
81 G & K	1027 896 M91
82 G & K	1027 896 M91
101 Jr.	1027 896 M91
102 Jr.	1027 896 M91
101	1027 896 M91
102	1027 896 M91
201	1027 896 M91
203 G & K	1027 896 M91
11 Pony	1027 896 M91
16 Pacer	1027 896 M91
20 G & K	1027 896 M91
21 Colt	1027 896 M91
22 G & K	1027 896 M91
23 G & K	1027 896 M91
30 G & K	1027 896 M91
33 G & K	1027 896 M91
44 G & K	1027 896 M91
44-6 G & K	1027 896 M91
44 Spec. G & K	1027 896 M91
55 G & K	1027 896 M91
333 G & K	1027 896 M91
444 G & K	1027 896 M91
555 G & K	1027 896 M91
TE 20	1027 896 M91
TEA-20	1027 894 M91
TO 20 G & K	1027 896 M91
TO 30 G & K	1027 896 M91
F 40	1027 896 M91
TO 35	1027 896 M91
MF 35	1027 896 M91
MH 50	1027 896 M91
MF 50	1027 896 M91
MF 65	1027 896 M91
MF 85/88	1027 896 M91
MF Super 90	1027 896 M91
L.P.G.	
44 LP (Gap .020")	1027 894 M91
44 Spec. LP (Gap .020")	1027 894 M91
55 LP (Gap .020")	1027 894 M91
333 LP (Gap .020")	1027 894 M91
444 LP (Gap .020")	1027 894 M91
555 LP (Gap .020")	1027 894 M91
MF 50 LP (Gap .020")	1027 894 M91
MF 65 LP (Gap .020")	1027 894 M91
MF 85/88 LP (Gap .020")	1027 894 M91
MF Super 90 LP(Gap.020")	1027 894 M91
MF 95 Super LP(Gap.020")	1027 894 M91
MF 97 Super LP(Gap.020")	1027 894 M91
McCORMICK DEERING (See International Harvester)	
MERCER	1027 436 M91
MINNEAPOLIS-MOLINE	
Gap (Low Compr. .025"-.030") (Hi- Compr. .022" -.025")	
FT, FTA, KT, KTA, MT, MTA, UDLX 14 mm Hds. (L.P.G.)	1027 432 M91
Series G, R, U, Z, LA, M5, 335, 445, 2-4-5 Star Crawler 18 mm Hds.	
Gasoline	
Normal Service	1027 896 M91
Tractor Fuel	
Normal Service	1027 896 M91
Light Service	1027 898 M91
L.P.G.	
Normal Service	1027 894 M91
Light Service	1027 896 M91
14 mm Hds.	
Gasoline & L.P.G.	
Normal Service	1027 434 M91
Light Service	1027 436 M91
Tractor Fuel	
Normal & Light Service	1027 436 M91
MOGUL (See International)	
NICHOLS & SHEPHARD	
Mdls. 6, 8, 10, 12	1027 896 M91
Mdls. with Kerosene Attach. (14 mm Hds.)	1027 436 M91
NORSEMAN (Canada)	1027 434 M91
NUFFIELD (British)	
18 mm Hds.	1027 896 M91
OLIVER	
HC Mdls. 55, Super 55, 60, 66, Super 66, 70, 77 Super, 77, 88, Super 88, Super 99, 166, 177, 188, 199, 550, 660, 770, 880, 950	
Normal & Light	1027 896 M91
Heavy	1027 894 M91
60KD, 70KD, 66KD, 77KD, 88KD,	
Normal	1027 896 M91
Heavy	1027 894 M91
Light	1027 898 M91
1800HC	1027 462 M91
OLIVER "Crawlers"	
BG, OC-3, OC-6, OC-12 14 mm Hds.	1027 434 M91
OC-4, -3G	1027 430 M91
AG-6	1027 896 M91
Starting for Diesel mdls. AD, BD, DD	1027 434 M91
BGS	1027 442 M91
PANTHER	
18 mm Hds.	1027 896 M91
Gasoline	1027 434 M91
Kerosene	1027 436 M91
POWER HORSE	1027 432 M91
RANSOME (Canada)	
(Gap .030"-.035")	1027 896 M91
REGAL (See "Custom")	
SILVER KING using:	
Herc. IXB-3	1027 430 M91
Cont. F124, F162	1027 896 M91
Own eng. 41	1027 896 M91
TERRATRAC	1027 896 M91
TIGER	1027 434 M91
TITAN (See International)	
TORO using:	
Ford engine	1027 442 M91
Husky 1/2 h.p.	1027 434 M91
Mdl. ME: other 18 mm	1027 896 M91
(Also see Power Mowers)	
TRACKMASTER (Canada)	1027 896 M91
USTRAC	
All Models	1027 896 M91
VIKING	1027 896 M91
WESTERN	
All Models	1027 434 M91

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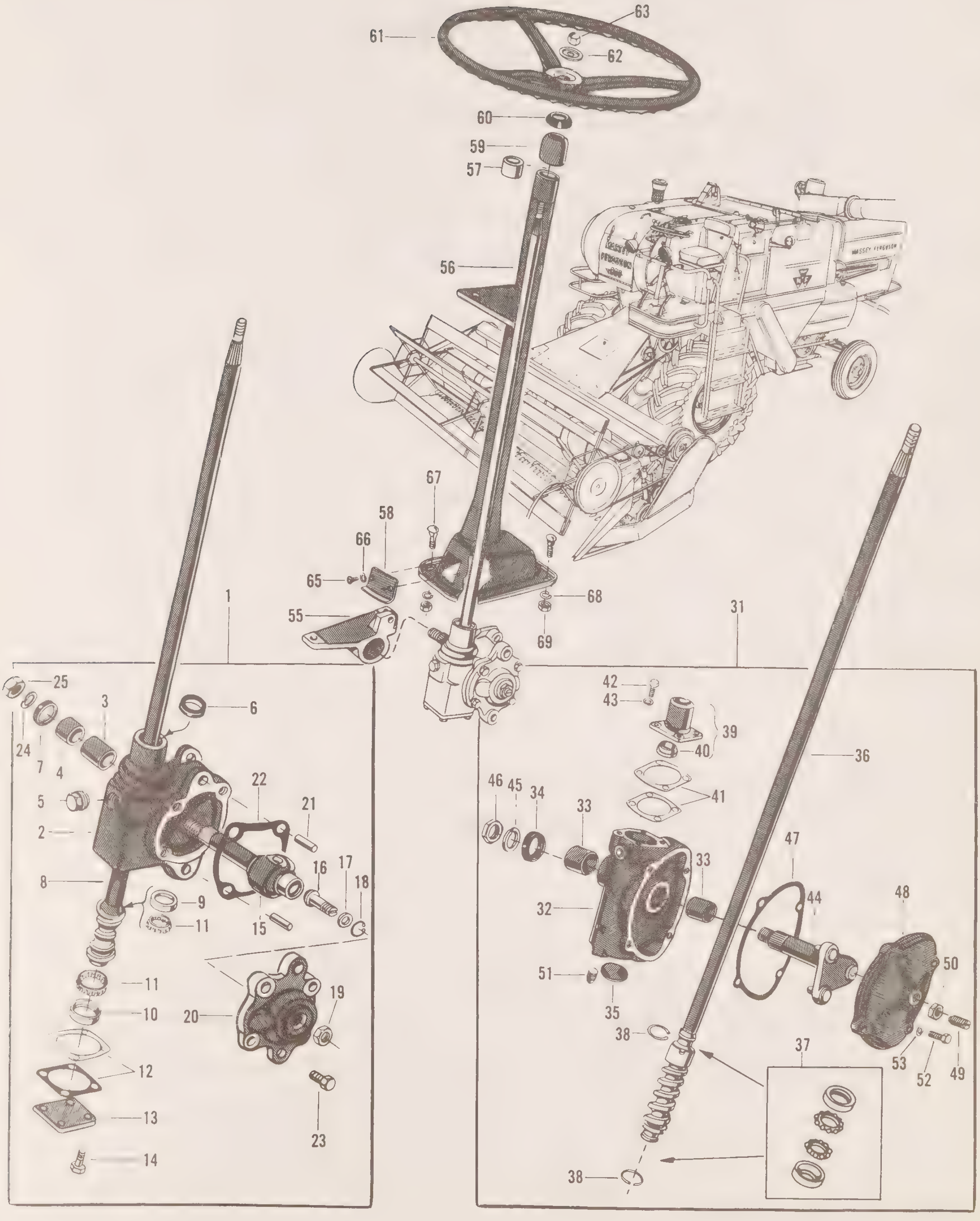
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EMERGENCY ORDERS

MF recognizes the vital necessity of providing fast emergency parts service. The company has organized its parts operation to provide such service. Moreover, MF is constantly evaluating its system and introducing improved procedures to enhance that service.

Emergency Parts Defined

As a matter of definition, an "emergency part" is one whose malfunction (from either normal wear or user abuse or misuse) has rendered a farm machine inoperative during its season of use --and which is then designated as an emergency by the dealer when he contacts the branch servicing him. In most instances, however, the dealer himself already has the part in his own inventory --and thereby automatically prevents the development of an emergency supply problem.

His ability to do so is predicted on an analysis of the history of parts requirements, correlated with the seasonality of demand, and the subsequent advanced ordering of parts.

The rendering of fast repairs in emergencies, i.e., the actual fixing of the inoperative machine once the emergency repair part is in hand, is done either by the dealer's service staff, an independent repair shop or the farmer himself.

To increase the dealer's own service competence, MF offers dealer service personnel training at its service school centrally located in Indianapolis, Indiana. The school possesses excellent classroom and other instructional facilities which is one of the reasons this particular site was selected. In the last eight years, more than 1,400 mechanics from MF's Canadian dealerships have attended this school.

Since dealers are independent businessmen, MF can exercise no direct control over the repair job itself. The company, however, does encourage dealers to provide fast, high quality repair service. The main point of MF contact with the dealer in this regard is the branch service manager and service representatives operating under him who advise dealers on service problems.

Whose Responsibility?

With further reference to the question of actually performing repairs, as opposed to the question of parts availability, MF believes that the farmer has an obligation to himself to ensure that his machinery be properly serviced prior to its season of use. Good sense dictates this rather than incurring the risk of the machine being down during its season of use.

MF has endeavored, through the publications and other means described in chapter V on marketing, to inform the farmer what he can do to help maintain his machinery.

D. T. McFarlane, Saskatchewan minister of agriculture, has suggested a farmer should make field notes on problems, adjustments required, parts that need sharpening, reinforcing or appear severely worn during the seasonal operation of each machine. At the end of the season the machine should be cleaned and inspected. If commercial repairs are necessary, these should be arranged and performed early in the off season. Massey-Ferguson agrees completely.

Similarly, the Alberta Wheat Pool brief made the recommendation that:

> "Farmers themselves can assist dealers by checking over out-of-season equipment and ordering parts well in advance of actual need. Major tractor overhaul, for example, should be considered during the off-season, if at all possible".

Again the company agrees and should like to register its strong belief which dovetails with the implication of both Minister McFarlane and the Alberta Wheat Pool's statement: that farmers share a responsibility with the dealer and the manufacturer to keep their machinery running. The suggestions made above are excellent and, if practiced, would do much to reduce the possibility of a machine being down in the rush season.

Massey-Ferguson does not believe, however, that emergency maintenance problems can ever be absolutely 100 percent eliminated. Machinery will

always be subject to wear and to the consequences of human error. MF does believe, though, that more concern with routine machine maintenance would reduce the farmer's concern with emergency maintenance.

Some dealers offer an incentive to farmers for off-season maintenance. Similarly, the company encourages farmers to perform less complex forms of maintenance by offering replacement part kits. This tends to relieve pressure on dealers, particularly during the rush season.

Also, through its dealers, the company encourages farmers to purchase a quantity of a particular part sufficient to fill their needs for a reasonable period of time.

What happens when a dealer is unable to supply an emergency part off his own shelf? First, it must be emphasized that no dealer, no subwarehouse and no branch warehouse can stock all of MF's 100,000-plus parts. Nor is there a need to, for the particular mixture of machines to be found in any one farming area served by a Canadian branch warehouse normally can be serviced with 17,000 to 35,000 different parts. Still, no dealer has the space or money to maintain an inventory of this dimension.

The parts he does maintain are carefully selected, based on the types and models of MF machines which farmers are using in the area he serves. Some of these parts are ordered at regular intervals on a semi-automatic

basis. Others, for which the demand is more seasonal, are ordered and received weeks in advance of the anticipated need for them. These parts ordering programs explain why the dealer is able to supply, off the shelf, nearly all the emergency parts his customers need.

The Emergency Sequence

The exception occurs as the result of an unpredictable rash of trouble with a particular part or as the result of the malfunctioning of a part which has a negligible history of trouble.

If the dealer does not have the part on his shelf, he must determine from the farmer if the lack of the part is causing an emergency. This is an essential point in the whole process of getting a replacement. For, if the dealer fails to notify his branch that his is an emergency order, the parts supply system will treat the request as routine. Dealers, of course, are continuously counseled by branch representatives to clearly designate emergency orders. The next six pages show examples of correspondence related to emergency parts service. Included, for example, are branch personnel home phone listings and bulletins informing dealers of emergency parts ordering procedures.

Once the dealer has signaled an emergency, the resources of the entire Canadian parts supply operation and the master North American Parts Operation warehouse in Racine are brought to bear to provide the part.

CIRCULAR #236

Massey-Ferguson Industries Limited

[illegible address line], Calgary, Canada

August 18, 1965.

TO:ALL DEALERS,
ALBERTA & B.C.

Dear Sir :

EMERGENCY PARTS SERVICE ON CRITICAL DOWN MACHINES

An extra effort on the part of each of us will be required to harvest the bumper crop.

ThisParts Department will do everything possible to secure Parts in Emergency situations when the machine is down in the field.

EMERGENCY PROCEDURE

1. Make sure we are made aware that the Part is required for an Emergency.

PLEASE * DO NOT ABUSE

2. If we should be out of stock we will first telex all Western Canadian Branches and, if the Part is located, it will be rushed the best way, direct to you.

3. Failing to locate the Part at a Branch, we will immediately place an order from Racine or Brantford, this will be done by telex.

4. Follow up and expedite all out of stock items.

This is going to be one of the biggest Parts years and naturally there will be some items in short supply.

It is sincerely hoped that you will use this emergency system only when absolutely necessary and in this way it will allow us the necessary time to get your regular orders attended too thus trying to give the best possible service, which you can pass on to your customers.

Yours truly,
MASSEY-FERGUSON INDUSTRIES LIMITED,

F V Black

FVB/t

Parts Supervisor.

Massey-Ferguson Industries Limited

1325 Ellice Ave., Winnipeg 21, Canada

August 10, 1966.

TO ALL DEALERS
WINNIPEG BRANCH

EMERGENCY PARTS SERVICE

During the Harvest Season, the Parts Department will have a man available to ship emergency parts, on Saturdays and Sundays.

The employee on duty will be in the office Saturday morning only, but can be contacted at the phone listed.

DEALERS ARE ASKED TO KEEP THEIR ORDERS TO EMERGENCY PARTS ONLY.

If unable to contact man on duty, phone - O.H.Webb
CH7-6566.

DATE	EMPLOYEE	PHONE
Aug. 13-14	W. McDougall, H. Reige	CH7-2755
Aug. 20-21	D. Ardron, J. Mealy	SP2-2749
Aug. 27-28	O. H. Webb	CH7-6566
Sept. 3-4-5	N. Williamson, T. McLay	SP4-5079
Sept. 10-11	W. McDougall, H. Reige	CH7-2755
Sept. 17-18	D. Ardron, J. Mealy	Sp2-2749

O. H. Webb,
Parts Supervisor.

OHW/sm
#168

A. M. Whitton

Massey-Ferguson Industries Limited

318-328 Eleventh Ave. S. E., Calgary, Canada

May 11, 1967.

TO DEALERS:
District 1 to 9 inclusive

E M E R G E N C Y   O R D E R S

WEEKENDS - - - -HOLIDAYS

Commencing May 20, 1967 and until further notice-

The Calgary Parts Department will have a skeleton staff from 8:30 A.M. until 12 noon, each Saturday for Emergency Parts only.

On May 22, 1967, because of the Victoria Day Holiday, the office will be open during the day with a skeleton staff to supply Emergency Parts.

The co-operation of all dealers is requested in keeping their orders to EMERGENCY PARTS ONLY, due to the limited staff which will be on duty.

MASSEY FERGUSON INDUSTRIES LIMITED,

F V Black

FVB/t

Parts Supervisor.

Massey-Ferguson

June 16, 1967

MEMORANDUM

To: TORONTO: Mr. A. W. Moffat, General Sales Manager, Canadian Division

From: CALGARY: Mr. A. M. Whitton, Branch Manager

Subject: - Emergency Parts Service -

Further to your letter of June 14th, relative to Emergency Parts Service, since the writer has been at this Branch, we have always made necessary arrangements for Emergency Parts Service.

We arrange to have a skeleton staff on each Saturday from 8:30 to 12 noon; also on holidays.

As soon as the harvest season begins, we remain open all day Saturday, and all Dealers have been supplied with telephone numbers for emergency calls on Sundays, if and when necessary. Our parts foremen, both Edmonton and Calgary, handle the Sunday calls and they are re-imbursed for mileage and time if and when they are required to make visitations to the Branch for parts.

We are attaching a Circular which was sent out on May 11th, to all Dealers; a similar Circular was sent out from the Edmonton Sales Office, and prior to any holiday - as an example, the July 3rd Holiday, a Circular goes to the Dealers advising them of the skeleton staff.

We sincerely trust this serves the identical purpose as the circular put out by Winnipeg, other than the fact they commence this service in August, and we follow it through from the beginning of the spring seeding season.

A M Whitton
Branch Manager

AMW:s
Att

Massey-Ferguson Industries Limited

425 Horner Avenue, Toronto 14, Canada

June 30, 1967.

TO: ALL DEALERS
TORONTO BRANCH

EMERGENCY PARTS SERVICE

During the harvest season the Parts Department will have a man available for pick up emergency parts, on Saturdays and Sundays.

The employee on duty will be in the office Saturday morning only, but can be contacted at the phone listed.

Dealers are asked to keep their orders to emergency parts only.

Date			Phone
Aug 5-6	Ralph Adam	London	451-9953
Aug 12-13	Roy Mahoney	Ingersoll	485-0984
Aug 19-20	Pete Gray	Toronto	255-3867
Aug 26-27	J. Simmons	Toronto	255-5923
Sept 2-3	C. White	London	455-4387
Sept 9-10	L.J.Vipond	Toronto	251-9120

Yours truly,

MASSEY FERGUSON INDUSTRIES LIMITED

L. J. Vipond

L.J.Vipond
Parts Supervisor
Toronto Branch.

LJV/lo

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Massey-Ferguson Industries Limited

1325 Ellice Ave., Winnipeg 21, Canada

July 26, 1967

TO ALL DEALERS
WINNIPEG BRANCH

EMERGENCY PARTS SERVICE

During the Harvest Season, the Parts Department will have a man available to ship emergency parts, on Saturdays and Sundays.

The employee on duty will be in the office Saturday morning only, but can be contacted at the phone listed.

DEALERS ARE ASKED TO KEEP THEIR ORDERS TO EMERGENCY PARTS ONLY.

If unable to contact man on duty, phone - O.H.Webb CH7-6566.

DATE	EMPLOYEE	PHONE
Aug. 12-13	D. Ardron, J. Mealy	SP2-2749
Aug. 19-20	W. McDougall, J. Berthelette	CH7-2755
Aug. 26-27	N. Williamson, D. Devaniuk	SP4-5079
Sept. 2-3-4	D. Ardron, J. Mealy	SP2-2749
Sept. 9-10	W. McDougall, J. Berthelette	CH7-2755
Sept. 16-17	N. Williamson, D. Devaniuk	Sp4-5079

O. H. Webb,
Parts Supervisor.

OHW/sm
#156

Consider these resources a moment. First, of course, there are the inventories of other local MF dealers. The dealer may well attempt to obtain a part he temporarily lacks from a neighboring dealer. If the part is not locally available the dealer's recourse is then to his branch.

As explained earlier, there are five branches in Canada. Each of them has its own parts warehouse. There are also four sub-branch warehouses. Each sub-branch carried approximately the same inventory as its parent branch's warehouse. (On the average, 28,000 parts numbers compared to 32,000). These sub-branch warehouses plug the geographical gaps, so to speak, between the branches. In addition, there is a master parts warehouse for all Canada in Brantford. Supporting this activity, as mentioned earlier, in Racine is the master North American warehouse, stocking over 100,000 different parts.

Finally, in the event of an emergency, the company can call on its factories to supply a part in current manufacture even if this would mean stopping the production run then underway. Such is MF's philosophy of meeting emergency situations.

The geographical location of each of these facilities, its breadth of inventory and its depth of inventory have all been carefully rationalized in relationship to the prime area it serves and in relationship to the support it may be called upon to render other

supply points in the total system. The breadth and depth of its inventory reflects the interaction of these factors. All these resources, then, are at the disposal of the dealer who contacts his branch when he is unable to fill an emergency request.

Dealer-to-Branch-to-Master Warehouse

When the dealer contacts the branch, and the branch does not have the part needed, it takes immediate action to locate it. First, as a rule, all other branches and sub-branches in the general area, e.g., western Canada and the U.S. northwest, are telexed simultaneously in an effort to locate the item. When the part has been located, the nearest branch which has it sends it by the fastest method available directly to the dealer.

If no branch or sub-branch has the part, a request is telexed immediately to the master Canadian warehouse in Brantford. If the part is not available there, the request is referred at once to the master North American Parts Operation warehouse in Racine.

Emergency orders referred to Brantford or Racine automatically trigger the print-out of a shipping order, shipping label and dealer invoice. Such teleprocessing is planned for branches throughout North America by the end of 1969 and should help to further accelerate the receipt of emergency parts.

Speed, System Design and Human Judgment

Three important aspects of the emergency ordering system may not be fully evident from this description. First, the speed of the querying process. The entire system can be searched in an hour or two. However, the further away from the requesting point the part is located, the longer, in general, it will take for that part, once found, to reach the farmer.

Second, the basic design and rationalization of the system enables the system to satisfy the vast preponderance of emergency requests closer to, as opposed to further away from the dealers. About 95 percent of emergency orders are filled by the dealer's own branch; the other Canadian branches and their sub-branches collectively bring this total to about 98 percent. The remaining two percent must be obtained through the master Canadian warehouse in Brantford or North American warehouse in Racine.

Racine's inventory normally contains all MF parts. These are drawn of course from MF factories and in some cases, outside suppliers. The question might be asked, "If Brantford and Racine have such complete inventories, why doesn't the branch order directly from them rather than searching the system?" The answer is that the branch does, if it will get the part to the dealer faster.

The third point, perhaps illustrated by the last statement, is that

the system both demands and accommodates the exercise of judgment at each level. Such judgment is facilitated by telecommunications tying the system together and the frequent circulation of branch stock level reports. These reports enable parts men to tell at a glance which other branches may be able to supply a part.

Time Enroute Equals...

The time span between the dealer's order and the receipt of the part --if it is available at his branch --depends, of course, on the distance involved and speed of transportation available.

Approximately 43 percent of MF's Canadian dealers are within 100 miles of their branch and 83 percent are within 200 miles. Beyond 200 miles there is considerable variation. For instance, in Saskatchewan, only 2.8 percent of MF dealers are 200 miles distant from Saskatoon; however, 28 percent of the MF dealers served by the Calgary branch are 200 miles distant or further. For more detail on branch-to-dealer distances see the following table.

The second table shows minimum and maximum transporation times from Brantford and Racine master warehouses to Canadian branches. Using these tables, it is possible to estimate the in-transit time from either of the master warehouses to a farmer anywhere in Canada.

Distance of MF Dealers from Nearest MF Parts Warehouse

MF Branch Area	MF Parts Warehouse Locations	% of Dealers by Distance from Warehouse: 1-99	100 - 199	200 - 299	300 - 399	400 or more
Calgary	Edmonton Calgary	41	31	3	13	12
Saskatoon	Saskatoon Regina	51.6	45.6	(-----	--2.8--	-----)
Winnipeg	Winnipeg	41	53	5	0	1
Toronto	Toronto London	35	40	15	5	5
Montreal	Montreal Moncton	50	30	12	5	3

Minimum and Maximum Days Enroute for Parts Shipments

To Warehouse Location	From Brantford, Ontario: Air Minimum	Truck Maximum	From Racine, Wisconsin: Air Minimum	Truck Maximum
Edmonton	1	7	2	8
Calgary	1	7	2	8
Saskatoon	1	6	2	7
Regina	1	6	2	7
Winnipeg	1	5	2	6
Toronto	1	1	1	3
London	1	1	1	3
Montreal	1	3	2	5
Moncton	1	7	2	12

Shipping Time: Brantford to farthest Canadian dealer

Minimum	Maximum
(air)	(truck)
1 day	14 days

Shipping Time: Racine to farthest Canadian dealer

Minimum	Maximum
(air)	(truck)
2 days	15 days

Importance of Communications

These distances and the shipping times they generate obviously place a high premium on effective emergency communications. As mentioned earlier, each branch works in a number of ways to ensure that the dealers it serves avail themselves of the emergency parts service at their disposal.

First, there is direct and frequent personal contact between the dealer or his parts manager and MF's district manager and service representative. Secondly, there are periodic memos and bulletins that branches issue to the dealers they serve which explain emergency ordering procedures, remind the dealer that a busy parts service season is approaching and emphasize the importance of designating emergency parts service as such. Finally, to provide the dealer the fast emergency reaction he and his customers need, there are the branch personnel designated as night,

weekend and holiday telephone contacts.

Massey-Ferguson has noted with interest that presentations before this Commission last spring revealed that some farmers themselves are not aware of dealers' ability to accelerate parts service on emergency orders.

If the farmer does take the initiative in an emergency parts situation, sometimes he may not be able to contact his dealer. Sometimes dealers fail to specify that an order is an emergency order. And sometimes dealers fail to expedite emergency orders themselves --or through dealer oversight the emergency order may get sidetracked into a pile of bi-weekly orders.

In these circumstances the company has no real control. But it has, can and will continue to encourage the dealer to take full advantage of MF's emergency service to get his customers parts. In any event, the company will always, whatever the circumstances, endeavor to relieve the situation through use of unusual means to service the farmer.

How long does it take to obtain an emergency part? This question is impossible to answer. It should be stressed that the average dealer can probably hand to the farmer nine parts out of every ten he asks for. Only one time out of 100 will that tenth part be an emergency part --the lack of which is rendering a machine inoperative. Thus, in terms of total parts volume, only one time in 1,000 does the dealer's temporary

lack of a part contribute to an emergency.

The process by which that part is found has been described. An idea of how long the process takes is implicit in that description. MF, however, possesses no records showing actual times elapsed; and with no records or figures in its possession it would be misleading to suggest an average time.

Out-of-Stock Emergency Parts

The company does, however, possess figures showing the number of Canadian emergency part orders it could not supply from its warehouses compared to the number of routine part orders during the period January 9 - February 17, 1967. Of a total of 127,753 orders, only 59 -- or less than one-half of one-hundredth of one percent --were emergency orders which could not be filled from branch or master warehouse stocks. These had to be filled by MF factories or outside suppliers. The following table shows the data on a week-to-week basis.

Out-of-Stock Emergency Part Number Orders

Week (1967)	Total Part No. Orders	Emergency Part Numbers Out of Stock When Ordered	Out-of-Stock Emergency Part Numbers as a % of Total Part Numbers Ordered
1/09-1/15	16,541	13	0.07
1/16-1/20	14,076	4	0.02
1/23-1/29	29,766	9	0.03
1/30-2/05	19,138	13	0.06
2/06-2/12	26,212	12	0.04
2/13-2/19	21,961	8	0.03

The following table shows the total number of out-of-stock parts (emergency _and_ routine) as a percentage of all parts at the end of each month from November 1965 through June 1967.

Comparison of Number of Out-of-Stock Parts with Total Parts Numbers

Month	MF Sourced	Supplier Sourced	Total Out-of-Stock Parts	Total Parts Nos. in System (Number)	Out-of-Stock Parts as a % of Total Number (%)
- Fiscal Year 1966 -					
Nov. 1965	200	130	330	95,104	0.3
Dec. 1965	144	104	248	95,321	0.2
Jan. 1966	100	85	185	95,189	0.2
Feb. 1966	106	70	176	95,835	0.2
Mar. 1966	130	71	201	96,118	0.2
Apr. 1966	162	105	267	96,394	0.3
May 1966	173	150	323	96,079	0.3
Jun. 1966	169	177	346	96,554	0.3
Jly. 1966	131	170	301	96,742	0.3
Aug. 1966	142	161	303	97,024	0.3
Sept. 1966	192	176	368	97,657	0.3
Oct. 1966	165	183	348	98,779	0.3
- Fiscal Year 1967 -					
Nov. 1966	98	110	208	99,423	0.2
Dec. 1966	104	97	201	101,045	0.1
Jan. 1967	81	77	158	101,429	0.1
Feb. 1967	83	92	182	101,771	0.1
Mar. 1967	90	85	175	101,786	0.1
Apr. 1967	92	141	233	101,651	0.2
May 1967	127	114	241	101,205	0.2
Jun. 1967	133	131	264	101,608	0.2

Emergency Parts Elapsed Times

It might be asked why MF does not have time-elapsed figures. Consider the variables for a moment. The farmer is interested in the time elapsed from the moment his machine becomes inoperative until it is working again. Between those points in time he must contact his dealer; his dealer must contact the branch; the branch searches the system, finds the part, dispatches it; the dealer receives it and passes it to the farmer. Then the actual repair must be made. The portion of this cycle over which the company has control, i.e., from branch receipt of the emergency order until dispatch of the part, may be quite small in comparison to total time elapsed.

Even if time-lapse figures were available, average figures would tend to obscure the intensity of the farmer's anguish when he is faced with a delay in the filling his parts needs. The only way to reduce this anguish is through extraordinary service.

Emergency Parts Service Availability

Parts emergencies, particularly during the farmer's busiest periods, e.g., harvesting, occur without regard to the clock or the calendar, at night, on weekends and on holidays. Consequently, as stated earlier, dealers are furnished the home phone numbers of branch parts supervisors, order clerks, warehouse foremen, sales managers and the branch manager himself. Dealers frequently contact these men at their homes at night.

In general, branches are staffed with parts men on Saturdays, at least half a day. Over weekends and holidays, if the branch is not manned, parts personnel can be contacted at their homes. (It should be noted that provincial and municipal implementation and adoption of, or municipal by-laws reflecting, the Lord's Day Act, or other laws limiting the period during which business may be conducted, may delay parts services in some areas of Canada. Lord's Day laws also restrict the flow of commercial transportation on Sunday).

Both the Brantford and Racine master parts depots work on a split-shift schedule to meet emergencies. The company objective on emergency orders is same-day shipment, whether from a branch warehouse or a master parts depot. In most cases, this objective can be met if the order is received by at least 4 p.m. and, in some cases, as late as 5 p.m. Special delivery is made of emergency parts to railroad and air terminals. Emergency shipping costs are prepaid by the company and later recovered from the dealer. This may accelerate the delaer's receipt of the emergency part.

Percent Fill from Local Warehouses

In 1966, 94.4 percent of all orders for branch-stocked parts were filled from the branch initially receiving the order, and shipped either on the same day the order was placed (emergency order) or before a mutually established deadline (routine orders). In no month did the fill-rate from the nearest warehouse fall below 92.9 percent. An

additional three percent of the total received similarly fast service from neighboring branch warehouses. The remaining orders were filled on a priority basis if necessary, from the master parts depot at Brantford or Racine.

There has been a steady improvement in the percent of orders filled from the nearest warehouse since the institution of centralized inventory control in 1958 and its computerization the following year. Prior to 1958, a fill-rate of 85 percent was considered the best achievable. By 1963, the average for the year had risen to 92.3 percent. As already stated, the 1966 figure was 94.4 percent. Perhaps the best testimony to the success of computerized central inventory control is that other companies in the industry have followed, or are about to follow, MF's example.

In spite of notable improvement, however, delays and mix-ups on parts service do occur from time to time. Some of these shortcomings are undoubtably the result of human failings within the company, but many stem from ordering procedures, delays, or inaccuracies at the dealer or farmer level. The company constantly strives to minimize such errors, as mentioned earlier, by keeping dealers up-to-date on ordering procedures and providing dealers full opportunity and assistance in maintaining adequate parts inventory.

The Commission has asked, "Do you feel there is any justification for

complaints by Canadian farmers about the difficulty of getting repair parts or of the delay that often occurs before a part is available?" With reference to Massey-Ferguson the answer has to be, "We feel there is very little justification". MF certainly does not agree that "often" is the most precise word with which to describe the frequency of delay in obtaining parts. Parts problems do exist in actuality. This chapter has attempted to describe the actual dimension of the parts problem within MF.

* * *

In summary, MF believes that its repair parts service has improved significantly in recent years. The company is acutely aware that delays and mix-ups still can and do occur. Within the company, these delays are attributable to the phasing-in of new systems and the equipment supporting them.

The company, however, also faces some problems largely beyond its control. Outside suppliers, for example, sometimes fail to meet delivery schedules. At the end of February, this year, 1,474 different kinds of parts in various quantities, were 90 days overdue from outside suppliers. Another 706 were 60 days late and 986 more were 30 days late. To counteract late delivery, MF orders as far in advance as reasonably possible, follows up all orders before their due dates and continuously seeks alternative sources of supply. MF believes that, to the extent it is within its

power, it is doing what is possible to rectify delays from outside suppliers.

Also, parts supply to MF is sometimes interrupted by factors beyond the company's power to control, e.g., strikes at MF and at outside suppliers' factories. Transportation strikes also delay delivery, as does the exceptionally inclement weather which occurs not infrequently during the critical planting and harvesting seasons.

Overall, the present state of repair parts availability and service is the result of studies and improvements begun over 10 years ago. These are continuing today. The need for high quality repair parts and service is keenly felt throughout the company and routinely receives priority treatment. The attention paid repair parts parallels that accorded wholegoods in every way. However, the huge number of repair parts and the emergency nature of some parts service intensifies the concern MF devotes to this portion of the business.

Basic research into areas such as crop and livestock improvement, soil and water conservation, nutrition, farm processing techniques and pest control, however, is beyond the scope of MF's research program. The farm machinery industry obtains new knowledge in these and related fields from government agencies, such as the Agricultural Engineering Research Division of the U.S. Department of Agriculture, universities and other research institutions.

University Research

Typically, universities, particularly those with agriculture or agricultural engineering departments,are oriented toward applied research. The farm machinery industry finds this research beneficial in terms of hardware design advances. For example, at this time, the company is cosponsoring a research project with the University of Guelph. The objective is to develop new concepts for application in grain cleaning systems. This requires determining the interactions and relationships between the different physical variables that affect separation of kernels from chaff. Federal programs in the U.S. tend more toward basic research. But both provide data on possible new farm practices and products. Developments in plant breeding, planting practices, herbicides, insecticides, fertilizers, soil and water conservation, food processing, packaging and distribution all have a potential impact on farm machinery design.

Evolution or Revolution?

Because of reliance on outside sources for agricultural research,

MF generally follows rather than leads technological advances in agriculture. Also, because of the high costs of engineering and development, the industry must be reasonably certain that a market for a new machine does exist. In other words, the economic soundness of radical new farming techniques must be reasonably well demonstrated before a specialized machine will be designed and manufactured to mechanize these techniques.

Growth in Agricultural Productivity

This reasoning is perhaps responsible for the fact that advances in agricultural mechanization tend to be evolutionary rather than revolutionary. These circumstances, however, tend to obscure the basic and essential fact that the progressive sophistication and the increased power of today's farm equipment enable the farmer to produce crops more efficiently than ever before. There is no single development to which can be attributed the credit for this increased farm productivity. These developments include: seed improvement, new hybrid plants, fertilizer techniques, farm arrangement techniques, new farming methods, the use of herbicides and pesticides, improved irrigation techniques, improved knowledge of soils and land use conservation, etc. But Massey-Ferguson believes that progressive sophistication in the design of machinery has enabled the farmer to produce more, with less investment in time and money, than he was able to do with farm equipment 20 years ago.

One area in which the impact of mechanization can be pinpointed is in agricultural manpower in relationship to agricultural productivity. The number of persons employed in agriculture in Canada declined 20.8 percent from 1951 to 1961. In 1951, the 819,378 persons so engaged fed a nation of 14,009,429; in 1961, the 648,966 persons so engaged fed a nation of 18,238,247.

In other words, in 1951 each farmer or farm worker fed 17 Canadians; ten years later, he was feeding 28 --an increase of 64 percent which compares to an increase in gross national product of 43 percent over the same time span. (These figures neglect the increase in Canada's agricultural exports during the time span in question, an increase which would reflect even greater gains in agricultural productivity. And to this may be added the assumption that Canadians were eating considerably better, or at least more, in 1961 than in 1951.)

Intangible Benefits

The farmer also benefits from design advances in terms of less fatigue and greater comfort. Today's machines have eliminated much of the sheer toil from farming. This machinery is the result of evolutionary engineering over the last 20-25 years. There have been few "breakthroughs" since the Ferguson System for tractors and the practical self-propelled combine, developed by Massey-Harris, were introduced in the late '30s.

Substantiating the evolutionary nature of farm machinery development --and illustrating the diverse projects necessitated by the farmer's diverse needs --are more than 100 separate MF engineering research projects currently underway in North America. These are aimed at improvements in agricultural tractors and in grain harvesting, tilling, planting, fertilizing, cultivating and foraging equipment. One such research project concerns conical threshing machines. Prototypes are now being tested. Others include a hydraulic-mechanical system for implement draft control; an infinitely variable hydraulic transmission for tractors and combines; and advanced hydraulic transmissions.

MACHINERY DEVELOPMENT

A major new design development in machinery requires an average of three to five years from the original concept to the production line. The expenditures involved can be high, particularly in relation to the probable return on assets used. Development costs for the MF410 combine, for example, exceeded $1.7 million over nine years. A rigorous schedule of feasibility studies, design and stress analysis, construction of prototype and laboratory and field testing is followed prior to release for production.

This product development sequence includes designing new components and developing engineering specifications. Tests follow the design

stages of product development during which the engineers work closely with marketing's product planners and market researchers.

Coordination with Marketing and Manufacturing

In the later stages of product development, before a prototype is released for limited production, much joint activity is carried on by marketing and manufacturing. At the prototype stage, too, the engineering department subjects all critical parts to rigorous reliability testing in its laboratories. Prototype tests are also conducted in the field with marketing's assistance. These prototype tests enable both the engineers and marketers to evaluate the prototype's performance and to flag potential problems. These tests lead to design modifications which are then incorporated and tested at the late prototype stage. At the same time, manufacturing is evaluating the prototype and its specifications in order to establish the quality control requirements that will govern production runs.

The next stage calls for "limited production" models which are both field and laboratory tested. (The entire spectrum of MF's testing is discussed later in this chapter.) Refinements are introduced based on joint engineering-manufacturing-marketing agreement. Finally, the engineers provide component specifications compatible both with marketing's objectives in fulfilling customer needs and with the economic limitations faced in the manufacturing process.

This description can only hint at the expense necessary to research, design, test, tool up for, produce and market a new machine. In 1966, MF spent $23 million worldwide --nearly 2.5 percent of sales --for new product development and engineering. The MF new product development manual is backed up by thousands of engineering procedures and inter-departmental decisions necessary to ensure the new machine will actually fulfill its intended purpose.

Engineering and development costs at lot of money. Consider a moment the company's experience in developing its present line of tractors.

Engineering New Tractors

In the late '50s, the onward pace of technological development and the company's position in the tractor market clearly indicated that Massey-Ferguson needed an entire new line of tractors. To meet the need of big farmers MF planned models with greater horsepower. Additional models were needed to fill gaps in the rest of the line.

From the start, emphasis was placed on developing tractors that could be assembled in various ways from components manufactured in different countries. This was necessary to maintain and increase the flexibility of the international manufacturing complex.

The parent company's vice president engineering, who supervised the development of the new tractors, described the technical advances in

the new tractor line to a group of non-technical company personnel. These are his words:

> "I should like now to review with you some of the design changes so that you are aware of the many plus values that are being offered. Starting with the engines, all of these will now be direct injection engines with high fuel economy, powerful back-up torques --and smooth running with many revisions to eliminate old service complaints. The AD 152 engine in the MF135 tractor replaces the old indirect combustion engine. The family of engines, from which this new engine was derived, is in use in more tractors in the world than any other engine ever built. The reliable AD 203 in the MF165 tractor is an outstanding performer and has the best fuel economy of any engine in this power range. The completely new AD 236 engine in the MF175 tractor includes a built-in balancer to ensure smooth operation at all speeds and is another outstanding performer. In the 1100 series, the AD 354, and its turbo-charged companion, provide power plants matched to the performance requirements of these big machines. The AD 107 engine has been redesigned for use in the MF130 so that this, too,

will be a frameless tractor matching all of the other tractors in the line. Particular attention has been given to the accessory equipment of the engines in terms of reliability and serviceability.

"In the following remarks, I will be treating the MF135, 165 and 175 tractors as a group to outline some of their changes and features. The front axles have been strengthened by increasing the stub axle diameters and their bearings. Strengthened hubs and improved hub sealings have been provided to align with the increased tire sizes that have come into use over the years. Standard duty and heavy axles are provided to meet local requirements.

"In the rear axles, strengthening improvements have been made in the crown wheel and pinion of the MF135 and a completely new rear axle epicyclic has been designed for the MF165 and 175. These have been designed with three pinion gears instead of two, to provide the additional strength in the driving torque to the wheels, and have been designed with straddle mounted pinion carriers in contrast to the earlier

carrier-mounted units to provide additional strength when operating with wide wheel tracks or heavy vertical axle loads.

"A sealed brake option is provided on the MF135 that will be most effective in difficult operating conditions such as paddy fields. Hand brakes have been incorporated on all machines to align with new safety standards.

"Along this line, we might comment that the legal requirements of all countries have been carefully surveyed and the design arranged to accommodate the many and varied requirements.

"The transmission has been improved and strengthened where required and can be obtained with either the six-speed box or the now well-proven and accepted Multi-Power 12-speed transmission.

"Changes have been made in the fuel tanks to provide increased fuel capacity in the larger machines and the fuel tank of the MF135 has been redesigned to facilitate the removal of

injectors without detaching the tank.

"The fuel tanks of the MF1100 are a completely new concept --saddle tanks that have many advantages such as removed from engine heat, large capacity, conveniently positioned at ground level for filling without risk of spillage across a hot engine.

"Particular care has been taken to provide the optimum of operator comfort; improved seats are provided as standard on all machines and spring suspension seats are available as optional equipment on all machines. The relationship of seat to foot pedals, steering wheel and step plates have been carefully considered and arranged to provide the optimum distances for the average human being. The instrument panel has been arranged for ease of observation by the operator, with provision for additional gauges as standard equipment. In addition to the tractormeter, oil pressure gauge and ammeter, standard on the old machines, we now add water temperature gauge, fuel contents gauge and a speedometer where required. Electroluminescent

lighting is provided in the design for operation at night and even a cigarette lighter is available as optional equipment.

"The heart of a modern tractor is its hydraulic system, and in this area we have incorporated improvements and new features that extend the use of the Ferguson System far beyond that available on the old machines and beyond that available on any competitive machine. This is a new breakthrough in the Ferguson concept and makes it possible to extend the advantages of the Ferguson System to pull-type implements and equipment.

"The internals of the hydraulic system have been improved by increasing the pump capacity and increasing the lift capacity on all machines. The lift capacity of the MF135 and 165 has been increased by approximately 10 percent and the lift capacity of the MF175 has been increased by 30 percent as compared to the old MF65. The internals of the hydraulic system have been redesigned to provide improvement over the old draft control. Better response speed is provided and improved stability is built in.

"A completely new feature designed into the system and available as optional equipment is Pressure Control. Under this system, drawbar equipment such as plows, harrows, trailers and balers can be operated with the advantages of weight transfer that permits a lightweight tractor to do a heavy duty job. It is not necessary to build in dead weight as our competitors must in order to provide the traction. We obtain the traction when we need it by this sophisticated means of transferring a portion of the implement weight of just the amount required to provide proper traction. This is a big plus and in many cases makes a small machine the equal in lugging ability of the next larger category.

"The operator's controls have been rearranged for convenience of operation. A separate draft control lever has been provided, incorporating all the draft control functions, so that in this mode of operation only one lever is needed. A separate response control lever is provided so that once set, this need not be disturbed until the implement is changed. The position control lever, separated from the draft control lever, provides

this useful function and when a tractor is equipped with Pressure Control, this same lever in another sector provides the adjustment for the graduated response required for optimum weight transfer from trailed equipment. Subtle improvements in operation are being developed in using the Pressure Control system in conjunction with the draft control system. These new hydraulics are a 'first' in the industry and can have the same impact in increasing the utility of a tractor as did the introduction of the original Ferguson System.

"Additional auxiliary hydraulic services are provided as optional equipment. A separate pump can be factory-installed in conjunction with valves to permit us to utilize this hydraulic power, either separately or simultaneously, with the use of the standard hydraulics, or the flow of the auxiliary and main pumps can be combined to provide for the high speed, high power requirements of auxiliary equipment. When the auxiliary pump is supplied, an oil cooler is provided to ensure controlled temperature of the hydraulic system. This same pump can provide the power for

the hydraulic clutch of the multi-power transmission when this is fitted to the tractor.

"Auxiliary equipment to fully utilize these features is now under development and will be available with the machines. Special hitches for the utilization of Pressure Control, automatic trailer hitches and quick hitches for mounted equipment are all under development.

"The sheet metal, of course, is new and this has been styled to present a pleasing, massive appearance with a family similarity throughout the entire line. But there is more than style built into this sheet metal. It has been arranged to provide accessibility during servicing, for simplicity and ease when fueling the tractor or servicing the battery or cooling system. The application of cabs and roll-over bars has been carefully considered for ease of installation, so that a tractor may be serviced without removal of the cab. Ready access for the air cleaner is provided and a free, unobstructed flow of air through the radiator and across the engine has been considered in the design."

ments in farm machinery but from chemo-synthesis or from farming the seas and oceans.

SPECIALIZATION OF FARM MACHINERY

Regardless of opinions on long-range prospects for improving food production, today's farmer demands an increasing variety of specialized farm machinery as farming changes more and more from a mode of existence to an entrepreneurial undertaking.

This new dimension to farming has placed new demands on farm machinery manufacturers. In March of this year, the government of British Columbia went on record before this Royal Commission with two statements in this regard: (1) need for encouragement of, and an accelerated pace in, the development of machinery for special crops, and (2) the need for a more complete range of farm machinery capacities, under a wider range of farm production conditions.

Massey-Ferguson, functioning within the exigencies of a competitive, supply-and-demand system, believes its record of innovation and machine development conforms to the realities of such a system. Indeed, the more usual complaint would appear to be too rapid an enhancement of machine efficiency, as suggested by the British Columbia Federation of Agriculture, and others, in their briefs.

Nonetheless, today's farmer demands more convenience and comfort. Massey-Ferguson provides it in such features as cushioned seats, air-conditioned cabs, automatic transmissions, power steering and power brakes --some of which could be considered virtual necessities in view of the increased size, weight and power of certain machinery. In fact, the company feels so strongly about the importance of such features to the farmer --and particularly to his safe operation of the machinery-- that it has made some of them standard equipment, e.g., power steering and power brakes on MF1100 and 1130 tractors, and power steering of the MF510 self-propelled combine.

All of these features help reduce fatigue and thereby improve operator safety, comfort and efficiency. With regard to the increased tractor horsepower now available, agricultural engineers will often recommend that a farmer go up 10 horsepower in his purchase of a tractor to provide himself a little extra margin in case he encounters some unforeseen hinderance during a period of critical use.

Highly Specialized Machinery

In view of the complexity and specialization of modern agricultural practices, there is little possibility of reducing the present number of machine variations or of restricting the introduction of new models. A projection of current trends in machinery development would indicate that future machines may have to be custom designed for relatively smaller groups of customers. If so, MF may introduce a new element

of personnel into its engineering-manufacturing-marketing sequence, namely, the sales engineer. The same factors which would necessitate his services would also affect dealership operations, i.e., at the same time dealers are expanding into the retailing of "convenience" merchandise, they would have to know more and more about specialized requirements of individual customers.

Custom assembly is already a fact of life in the industry. This is reflected, for example, in the 60 versions of the MF135. Additionally, on each of these 60 versions, the farmer has a choice of two seats, three fender configurations, two different exhausts, four different drawbars and six tire sizes. Such customization can cause assembly scheduling problems. It definitely increases inventory and manufacturing costs; but it is a marketing necessity created by agricultural needs.

The combination of machinery features farmers want varies with crops, locality, farming methods, ability to invest and many other factors. To the efficient agribusinessman, the machine or implement which meets his unique requirements is a valuable if not indispensable asset.

MACHINE TESTING BY GOVERNMENT AGENCY

The proliferation of farm machinery variations at the farmer's option to meet his own peculiarly local needs underscores the complexities of field testing. One of the recurrent themes of earlier witnesses has been their desire for the re-institution of a governmental or university farm machinery testing program. Suggestions as to the dimension and responsibility for such a program have varied. However, the suggestions have all been intended to provide the farmer with machine performance, durability and suitability data. With these data in hand, the farmer can presumably select machinery more accurately to correspond with his exact operating conditions. Thus, the farmer would benefit in increased productivity, profit and, possibly, leisure. MF endorses these goals, but questions whether the suggested methods of achieving them are practical on the basis of economics, manpower or facilities they would require.

Severe Practical Difficulties

There are, in the company's view, severe practical difficulties in executing a program which could provide truly meaningful results to more than a small percentage of Canadian farmers. These difficulties arise from the overwhelming variety of test conditions that would be required.

Consider the permutations possible among the following factors:

- type of crop;
- maturity of crop;
- basic type of soil, e.g., sand, loam, clay;
- porosity of soil;
- moisture content of soil;
- moisture content of crop;
- profile variation of soil;
- variation of local topography;
- variation of altitude;
- variations in conservation practices;
- temperature;
- humidity;

- wind direction;

- wind velocity;

- local or personal variations in machine use or management based on local custom or personal idiosyncracy.

Consider the explosive arithmetic of the problem. It can very crudely be estimated that these variables present approxiately 46 million different sets of operating conditions. That figure must then be multiplied by at least 100 to accommodate the various machines of the different manufacturers. The result must then be multiplied by, say, 50 to provide for the various combinations among these machines, e.g., a competitor's implement with an MF tractor. Such mathematics produces the mind-boggling figure of 230 billion sets of conditions which might require analysis and comparison. Even just considering the basic and arbitrarily-arrived-at figure of 46 million "test beds" it is obvious that each of Canada's 400,000-plus farmers must each cope with about 115 different operating conditions. It seems reasonable, therefore, to state that any machine, even the most specialized, is a compromise in relationship to the variety of conditions under which it will have to operate.

Compromise seems to be the key word. However, it was the experience

of the Saskatchewan Agricultural Machinery Administration, which was discontinued in 1964, that a corresponding compromise approach to testing is not satisfactory. As Saskatchewan agricultural minister Douglas McFarlane stated with reference to the defunct AMA, "In order to do the right kind of testing, it should be done on a larger scale".

Just how large that scale might have to be is suggested by the permutations cited earlier.

Professor H.P. Harrison, department of agricultural engineering, University of Alberta, indicated a similar viewpoint: that individual machine performance can be adequately assessed only after extended operation under a variety of crop, soil and climatic conditions.

MF MACHINERY AND COMPONENT TEST PROGRAMS

The company has an established sequence of machine testing and evaluation programs. With respect to any one product, this sequence begins in MF's engineering laboratories and continues not only through the machine's market introduction but throughout the machine's entire subsequent history of production.

Purpose of Testing

Viewed in economic terms, MF tests its products to provide protection

for its own and the farmer's investment. With respect to the company, testing (1) reduces the time and money that would otherwise have to be spent on field rectification programs; (2) lowers warranty costs; and (3) reduces the pressure on dealers for service. Testing enables the company to locate problems which, if embodied in production models, would cost far more to rectify than the testing program.

In addition to these direct economic considerations, MF's testing programs are dictated by the company's policy of providing quality products, ones which perform to the farmer's expectations. MF knows it must adhere to this policy in order to maintain its reputation and improve its position in the industry.

Reliability and Suitability

Massey-Ferguson's ability to improve its position in the industry is, in the final analysis, based on its machines' reliability: the performance characteristic that the farmer can measure most easily and objectively. He does so virtually automatically by using the machine and remembering the problems he experiences with it.

Suitability is a different concept. The company recognizes that the most reliable machine available is of marginal or no use to a farmer if the machine is not suited to his particular farming practices and needs. MF's answer is two-fold: (1) producing a full line of machinery with characteristics appropriate to those needs and prac-

tices; and (2) providing information to the farmer, through the numerous media described in chapter V, which enables him to make intelligent purchasing decisions.

Viewed another way, product suitability is established in the early marketing product development and engineering design stages. At those stages suitability is either successfully built in or it is not. The only way the farmer can get a "suitable" machine is through a careful purchasing decision. Reliability, on the other hand is not finally "built in" until the machine comes off the assembly line. For it to be "reliable" at that stage means that its individual components must embody reliability through (1) their basic design; (2) the quality of their materials; (3) their actual manufacture or physical formation; (4) their relationship to surrounding or contingent components; and (5) through the quality of their assembly, one with the other.

How does MF predict the reliability problems a typical farmer might encounter using one of its machines? Reliability testing, based on sophisticated statistical methods, is the answer. The statistical approach is of utmost importance; for it alone enables the company to achieve <u>economically</u> the assurance, or statistical confidence, that its machines are reliable --as opposed to assurance based on <u>known</u> or individually demonstrated reliability. Stated differently, the company compromises --but it compromises through statistical

knowledge. If machines had to be individually tested for reliability, MF could not afford to produce highly complex products such as tractors and combines; and the farmer could not afford to buy them.

The company is continually developing and applying advanced physical techniques for reliability testing which should increase MF's level of confidence in the statistical results. This is necessitated by MF's recognition that tests which proved satisfactory for earlier, less complex machines do not, in general, accommodate all the interactions of components with each other and in combination with the wide range of operating conditions to which today's more complex machines are subject. In other words, the company is not yet able to predict some machine performance with what MF considers a requisite degree of accuracy. And this is why the company is developing the advanced techniques mentioned above, a subject which shall be treated later.

<u>The Testing Sequence at a Glance</u>

From initial concept to manufacturing quality control, years after a machine's established success in the market, the company protects its own and the farmer's investment through a continuum of tests which blankets the entire engineering-manufacturing-market sequence at every juncture that is susceptible to undesirable happenstance or product quality deterioration for whatever reason. In general, testing follows the sequence shown below:

Pre-production testing:

- laboratory testing of prototype or initial production components for endurance and performance;

- engineering field testing of prototype machine for endurance and performance;

- engineering proving ground testing of prototype machine endurance and performance;

- customer use evaluation, i.e., field use by farmers of pre-production models to evaluate the machine's day-in, day-out performance under different crop and soil conditions.

Post production testing:

- engineering laboratory tests of new production models' endurance and performance;

- engineering field surveillance testing of early production model machines;

- continuing reliability testing of standard production model components by the North American Quality Control Centre;

- endurance and performance testing of both new and current production models by the North American Quality Control Centre.

Laboratory Testing of Prototype Components

An example of this phase of the testing cycle is the laboratory development and testing program that supported the new line of Massey-Ferguson tractors introduced in 1965. At the core of this program were over 30,000 hours of performance and chassis dynamometer testing plus thorough stress analysis of each basic chassis.

In addition, hundreds of separate tests were conducted on individual components and sub-systems. Substantial proving ground and field testing, in excess of 32,000 hours on 32 different prototypes, also stands behind these machines. This line of machines includes the MF130, 135, 150, 165, 175, 180, 1100 and 1130. These tractors range in power from 25 to 120 PTO horsepower.

MF's tractor engineering laboratories are located at the Engineering and Research Centre in Detroit, Michigan where they occupy a building of approximately 30,000 square feet. The facility is divided into

four separate sections, covering dynamometer testing, physical testing, hydraulic systems, and material analysis.

The basis of the laboratory program for each new tractor model was a group of five tests:

- power-train tests;
- chassis structural tests;
- performance tests of complete tractors;
- chassis-dynamometer endurance tests;
- functional and reliability tests of components.

Power-train testing: this is evaluation and endurance testing of power-train components and lubricants. Over 16,000 hours of testing, almost all at loads corresponding to maximum engine torques, were accumulated in testing the new tractor models.

A specific example will illustrate this activity. Testing of pre-production power-trains for MF's largest tractor, the MF1130, built from initial limited quantities of production components, revealed damage to the rear axle planetary pinion pins. Earlier

prototype tests had shown no problems of this nature. The parts were supposedly identical and material analysis and hardness checks indicated no significant differences. The laboratory studied the problem with X-ray diffraction equipment and found that the sub-surface stress distribution was radically different on the two groups of pins. A specific cycle of heat treatment was consequently developed to produce the desired compressive stress.

Chassis structural testing: Massey-Ferguson agricultural tractors are built without load-bearing frames. This requires the engine, transmission and axle housing to carry all reactions and impacts from operating loads. Over the years, the engineering laboratories have developed a series of 11 structural tests which simulate horizontal and vertical one- and two-wheel loadings, reactions imposed by front end loaders, implement draft loads, and impact forces due to the tractor's own weight.

The bases for these more or less standardized tests are a considerable quantity of dynamic load measurements, using strain gauge techniques, gathered during field operations.

To test each new model, a complete tractor chassis was built and completely coated with brittle lacquer. The complete series of static loads was applied in increments and the coating studied to determine areas and magnitudes of stress. Strain gauges were applied

as necessary. Following the static loading, each mode was repeated for 50,000 cycles at a reduced load to ensure that the fatigue limit was not exceeded.

This full test program was repeated seven times, plus several retests, in order to cover the full range of tractor sizes, engine types and front axle variations.

Performance testing of complete tractor: each new prototype tractor model was given a complete series of performance tests on laboratory dynamometers. These included PTO performance, cooling system optimization, noise level and vibration measurements, and cold starting tests. In addition the engines, which had been engineered to MF's detailed requirements, were thoroughly evaluated for conformance to specifications.

During the program the laboratory logged over 6,700 hours of engine and tractor performance testing. The cold room was the scene of almost 200 starting tests at temperatures as low as minus 25 degrees F to ensure satisfactory starting of the new tractors.

Chassis dynamometer testing: a major phase of the test program was the endurance testing of complete tractors on two special chassis dynamometers. Power was transmitted to tractors' rear axles through a gearbox. The following tests were run on each model:

- continuous steering, under load, from full right to full left and return;

- continuous bending moment applied to the rear axles;

- continuous rocking, under load, of the front axle;

- periodic brake applications;

- periodic clutch cycles;

- cycling of the implement lift system with a simulated heavy mounted implement;

- cycling of external hydraulic system;

- differential action, achieved by de-clutching one chain and braking the other, to simulate sharp turns;

- transmission shifting "on-the-go", under load.

Such tests simulated most field operating activities in a variety of combinations and permitted round-the-clock operation independent of weather and crop conditions. The lab used its chassis dynamometer continuously to investigate a wide variety of design and reliability problems.

<u>Functional and reliability tests of components:</u> literally hundreds of other components, sub-assemblies and systems were individually tested. These tests ranged from mud bath of front wheel seals, through vibration tests of tachometers, plugging tests of air cleaners with crop fibres, and dust environment tests of hydraulic cylinders, to complete system evaluations of hydrostatic steering and central hydraulics.

In order to ensure a systematic approach to the problems of achieving structural and functional reliability, MF engineers decided early in the development program to require that functional specifications be developed and added to the drawings of all important components. In other words, it would not be sufficient to require that an item have certain dimensions, finishes and heat treatment, or that it be purchased from a certain vendor. The company required specification of the function the part --itself or in combination with other parts-- was required to perform, both how well and how long. Any characteristics the part was not to have were also specified.

Reducing these functional requirements to written specifications, in many cases before the parts were designed, served many useful purposes. Among them, it required early consultation between the design engineer and the test engineer, ensuring that the necessary test equipment would be available along with prototype parts. These written requirements also served as test procedures and greatly simplified the writing of reports. The entire tractor program was computer-scheduled on a

critical path network.

The following are examples of problems encountered and the solutions developed during the tractors' laboratory development:

- "afterboil", i.e., boiling in an engine's cooling system when the radiator fan ceases rotation, is possible in any cooling system when the engine stalls or is shut off hot. The cooling system should be able to prevent excessive coolant loss when this occurs. To ensure this ability MF engineers developed a specification requiring four successive fast shut-downs at a coolant temperature of 220 degrees F, without affecting the engine's overall cooling. This requirement represents a much-argued compromise between the total resistance to afterboil desired by the test engineers, and the cost and space limitations confronting the designers. It was necessary to re-design one of the three radiators in the new line to achieve this requirement;

- an auxiliary hydraulic system was developed for the MF175 and MF180 tractors to permit actuation of external hydraulic cylinders. The heart of this system is a pump located in the rear centerhousing and driven from the

constant running PTO gears. This pump has a flow control valve and supplies both the low-pressure Multi-Power transmission clutch and the high-pressure external hydraulic circuit. The test requirement for this pump involves 500,000 pressure cycles in both systems, using first clean and then contaminated oil supplies. As soon as testing began it became evident that the tests were destroying excessive numbers of pumps. Massive failure of drive gears, shafts, covers and internal pump components became daily events. Strain gauged structural tests of the components, detailed metallurgical and X-ray analyses of failed parts and logical analysis were all unable to identify the cause clearly.

The engineers finally resorted to continuous monitoring of all portions of the hydraulic circuit using an eight-channel high frequency response oscillograph. Examination of the traces at the moment of failure revealed, to the engineers' surprise, that failure resulted from hydraulic blockage triggered by an instantaneous malfunction of the low-pressure relief valve. A slight modification eliminated this condition and ended the string of problems;

- in order to develop and qualify the several types of engine clutches required for the new tractor line, MF engineers wrote a specification and then designed and built a special test dynamometer. This rig consisted of a 120-horsepower electric motor, torquemeter, control panel, eddycurrent dynamometer and variable inertia members. This rig enabled MF's engineers to select the cycle time, modulation, and load to produce the desired peak torque, energy input, and relative slip for each particular clutch. Endurance testing was then simply a matter of repetitive cycles under automatic control;

- a tractor's starter engine, which is vendor supplied, is a highly critical component; for if it malfunctions the entire tractor is out of action. Consequently, MF engineers developed tests of both the electrical and mechanical performance of these starter motors. Each of the four starters used in the new tractor line was required to complete 10,000 start-and-over-run cycles with nothing more than a brush adjustment. The related engine was filled with SAE 80 weight oil, to simulate cold weather condition, and the test sequence included:

  - engine starts;

- continuous cranking until the engine had over-run the starter for 1/2 to 3/4 of a second. Generator output voltage rise was used as a signal to disengage the starter;

- engine kills and rests. Rest time was controlled to prevent starter overheating.

Other activities involved in this new tractor program included the development of a hydro-pneumatic seat suspension system, development of Pressure Control for towed implements, and the less spectacular but equally vital material analyses of components, paints and lubricants.

Engineering Field Testing of Machine Prototypes

This testing serves many of the same purposes as the laboratory testing described above. However, it provides (1) testing of the whole machine as a unit and (2) testing in certain conditions which cannot be accurately simulated in the laboratory, e.g., problems encountered while operating in high grasses. This field testing is carried on throughout the year at the different test farms or sites MF owns or rents in North America.

Engineering Proving Ground Testing of Prototype Machines

This testing, conducted in Toronto and Detroit, is commonly referred

to as the "torture testing", for it submits the actual machine to extreme loads, stresses, vibrations, etc. These conditions are induced by driving the machine over what might best be described as the tractor or combine equivalent of a commando obstacle course. A relatively few hours of exposure to such testing is the equivalent of many years of actual operation. In a somewhat crude sense, this testing establishes whether or not the machine can "take it".

Customer Use Evaluation

This is the final pre-production model testing. It takes place under a wide variety of operating conditions and at the hands of actual farmers who give the machines the same treatment they will receive later throughout North America. The farmers use the machines for approximately 100 hours. MF survey teams visit their farms to observe whatever problems may arise. As a result of the farmers' evaluation, the survey team recommends changes to further improve performance. Also, the farmers' handling of the machinery may reveal a need for additional instructional details in the operator's manual.

The following are quotations from interviews with farmers who helped Massey-Ferguson evaluate its MF1100 and MF1130 tractors:

On platform design:

"I think its got one of the best platforms on the market. The platform's not too high which I think is a common fault with some of the competitive makes. This platform business is getting out of reason for height. It's too hard to get on and off. This is also a clear platform -- one that goes all the way across. It's open in front of the seat".

On Pressure Control:

"Well, some quack grass patches are really heavy draft when you get into them with the cultivators; it's just like dropping anchors into the ground; with Pressure Control, of course, you transfer additional weight onto the rear wheels and this enables you to pull through them. That's a lot more desirable from the farmer's point of view than lifting up and going over them".

"We think with the Pressure Control system it certainly gives the weight transfer that is desirable with your towed implement. It just shifted more weight to the tractor thereby giving the tractor more traction".

"The Pressure Control took my eye. It was something I wasn't used to but when we hitched it to loads and then used that Pressure Control and could move more than we could begin to otherwise".

On versatility, horsepower and economy:

"We thought that the tractors were a big improvement on anything that we'd had in the past; and they're big, rugged tractors -- tractors that were very versatile and had the horsepower to do most any job that I think that a man would demand of it. It's big enough to do most any job that we ask it to do, but at the same time, it's not too big to do smaller jobs and not too expensive to operate on these smaller jobs; and we're just real high on the 1100 tractor".

On power and traction:

"These tractors, both the 1100 and the 1130, outperformed the other make tractors. The 1130s had more power than any of the tractors there, hitched to the same load. We would hang one tractor up then put the other on the same load and the 1130 would pull the load where the others wouldn't".

On controls and handling:

"One of the things that I though was exceptionally fine on it which would be the ease of the controls and the operation of the tractor was real good. The platform was clear, wasn't cluttered up; the steering wheel had a -- one of the better points I think about it -- you could raise the steering wheel stand and operate the tractor and still have all your controls right at your fingertips".

On economy:

"I don't think you'll find a better motor in any tractor of this size. The motor has all the power needed for the tractor, is peppy and quiet and economical motor at the same time".

On breaking and traction:

"With deep breaking, we do have traction problems. We need horsepower and traction and we think that the 1100 has both".

On control placement:

"The controls were easy to get at".

On platform and power steering:

"I really like the platform plus the steering power. I mean it's really impressive. I like it".

On gasoline tank serviceability:

"I did like the saddle tanks for the gas because you could fill the gas tanks without crawling up on the tractor, right from the ground. It was no trouble at all to service this tractor".

The following five pages include the releases, among others, of the men who made these statements. Following these is a reproduction of an article from MF's FARM PROFIT magazine, which tells more about the company's customer use evaluation program.

Engineering Lab Tests of New Production Models

These, essentially, are repeats of earlier laboratory endurance and performance testing. Their purpose is to determine if any of the proven design quality of the earlier prototype and preproduction models has somehow deteriorated in the process of translation into actual production models. If it has, reliability standards are immediately reasserted.

Engineering Field Surveillance of Early Production Models

The purpose of this surveillance is the same as that of the production model engineering laboratory tests.

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Signatures
Harold H Reynolds
LeRoy Clifton
Wilfred Brown
Ollie P Cronin
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Robert Heck
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William Bitsogge
Robert R Penn
Fred Meighan
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Signatures Arthur Carter
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Gray Persinger
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Operation 1100 – 1130 Filming
Interview (SC 1001)

Signed O.B. Young

Address 1105 Aird St. Saskatoon

Witness ______________

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Operation 1100-1130 Motion Picture Interview (SC 1000)

Signed [illegible]

Address R R 5- [illegible]

Witness

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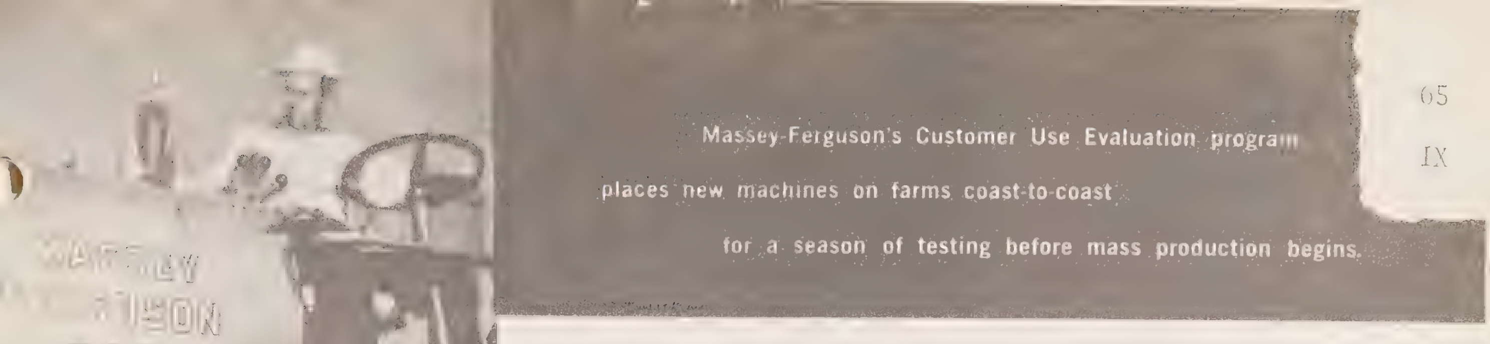
Operation 1100-1130 Motion Picture Interview (SC 1002)

Signed Fred M Kernen

Address 1400 Central Ave, Saskatoon.

Witness ____________



Missouri — George Miller, Wakenda, tested a pre-production model of the MF 300 combine, then went on to win the Missouri corn picking contest. He does custom work and tested the MF 300 in harvesting more than 800 acres of corn.

Farmers give new M-F

WHAT'S THE TOUGHEST test you can think of for a new piece of farm equipment? Probably, it's day-in, day-out farm use by all kinds of operators under as many different crop, soil and climate conditions as it's possible to find.

That's why Massey-Ferguson has developed a program to pre-test its new machines on a variety of farms where they get the same treatment as when they are sold in quantity, coast-to-coast.

This on-farm test program is the final step in years of development. For example, the new MF 300 combine went through five years of company tests before it was ready for Customer Use Evaluation. Massey-Ferguson engineers tested prototypes of the MF 300 in wheat fields of Arizona, California and the Snake River Valley of Idaho. They worked in soybeans in the Midwest and rice in Arkansas. MF 300's were equipped with a corn head and put to work harvesting corn in the Midwest.

Endurance and "torture" tests were scheduled for the MF 300 on M-F's engineering test farm. When the results of all of these tests were complete, refinements were made and 50 pre-production models were produced for the toughest challenge of all — a season of use on the farm.

These combines were placed in the hands of selected farmers where they would be exposed to the widest possible variety of harvest conditions. Dealers selected farmers who have a reputation as good machinery men. They often were "innovators" who are willing to try something new and to cooperate in a test program. They were asked to fill out a survey questionnaire after 100 hours of use and to cooperate with company survey teams who visit the farm.

Reports from farm users and from company warranty and service channels are gathered together for study by M-F survey teams. After considering these reports the teams fan out across the country to visit the test farms. Engineering, Service and Quality Control departments are represented on every team.

Farmers are questioned about every aspect of performance to get their suggestions for refinements. The machine is carefully checked over for points that show unusual wear.

After a week of interviewing, teams get together again to go over their findings. Quite often they discover that a point Western farmers say needs attention, also shows up in the Midwest, South or East. At the conclusion of this meeting, a list of suggested changes is prepared for production run models.

Quality Control represents the factory on the survey committee. This department recommends changes in manufacture that can help produce a better product.

Engineering representatives will make changes in design if farm performance brings out problems that make it necessary.

Service department representatives on the survey team assist jointly with Engineering and the Factory to decide changes that can bring top performance. Field surveys may also reveal the need to include additional instructions in operator's manuals.

"We like to go to the field and talk with the farmers who have been cooperating in our test program," says Gene Perry, M-F New Product Evaluation Specialist. "We find out what farmers like and don't like and that helps us build a better product."

What did the teams find out about the MF 300 combine? Actually, very few changes were required. After years of engineering tests in harvesting fields across the country, design problems largely had been solved. Farmers found the MF 300 delivered top performance in wheat, oats, rice, soybeans and corn.

The MF 300 with corn head did so well that two of the pre-production models won the state corn picking contests in Missouri and South Dakota.

With minor changes, as a result of the Customer Use Evaluation program, the MF 300 went into mass production last spring. These production models now can be seen at work on farms in every section of the country.

Cooperating farmers think this test program is a sound approach.

"A new product has to be tested on actual farms to show what it will do," declares Harvey Edelman, a Sabetha, Kan. farmer. "You can have a machine on the test track for months without developing some of the minor problems that may show up in working on the farm."

Harvey is one of the 50 farmers who cooperated in the M-F Customer Use Evaluation Program for the new Super 90 Multi-Power tractors.

Harold Holz, M-F Project Engineer for tractors, agrees with Harvey. "This on-farm test program gives us a chance to evaluate our products under many conditions. Farmers can do so many more things with a machine than we could possibly do with a few prototypes on our company farms and test tracks."

This Customer Use Evaluation program now is being used in proving many new MF models. Machines are being tested under farm conditions by the kind of people who will be using them in actual practice. Careful follow-up by Engineering, Quality Control and Service departments assures top performance when production models roll off the assembly line.

exas — M-F Dealer Excel Williams helped H. L. Ford, Hamlin, test the Super 90 in tough, Blackland soil.

Kansas—MF Super 90 with Multi-Power was tested on a Great Plains family farm by Harvey Edelman, Sabetha.

Illinois — John Gorzney, Milledgeville, gave his Super 90 Multi-Power a good workout on a typical Corn Belt farm.

roducts their final test

M-F Survey teams visit farms where pre-production models are being tested to learn first hand how they can be improved. Members of this Super 90 Multi-Power team on John Gorzney's farm near Milledgeville, Ill., are Gene Perry, Service department; Joe Sheldon, Quality Control department; and Harold Holz, Engineering department.

In 1965-66, for example, surveillance teams visited 380 farms in western Canada and Ontario whose owners had recently purchased an MF1100 or MF1130. These are the two most powerful tractors that MF produces; at the time, they had recently been introduced along with the company's entire new tractor line.

In this particular surveillance program, the team consisted of representatives from engineering, the quality control test centre, marketing's service division, the regional branch's service section and the local dealer.

At each farm, the team reviewed the performance of the new tractor, recorded complaints for possible engineering or manufacturing corrective action, and rendered on-the-spot servicing and adjustment. The following page reproduces the surveillance report form.

Production Component Reliability Testing by The North American Quality Control Centre

This centre is MF's manufacturing quality control watchdog. It tests both MF-manufactured and supplier-manufactured components for conformance to specifications established in the engineering laboratory development phase described above. To establish the reliability of one component in production quantities, the quality control centre tests a sample lot for conformance to specifications. The resulting test data enables quality control engineers to predict the performance,

TRACTOR DAILY FIELD SURVEILLANCE REPORT - 1965 MODELS

1. DATE	2. MODEL	3. HOURS	4. CHASSIS TYPE	5. ENGINE TYPE	4. TRANSMISSION TYPE
			A STD. CLEARANCE; B HIGH CLEARANCE; C DUAL TRICYCLE; D ROW CROP (4 WHEEL); E WESTERN		A STANDARD; B MULTIPOWER

7. TRACTOR ... NUMBER	8. ENGINE SERIAL NUMBER	9. TRANSMISSION SERIAL NUMBER	10. REAR AXLE SERIAL NUMBER

11. BRANCH 12. DATE PURCHASED	14. DEALER'S NAME	15. DEALER'S ADDRESS
13. REPORTED BY	16. OWNER'S NAME	17. OWNER'S ADDRESS

18. TRADE IN

19. OTHER MAJOR MACHINES OWNED

20. NO. OF ACRES IN FARM	21. NO. OF ACRES WORKED	22. TYPE OF CROPS

23. FIRST HEARD OF NEW TRACTOR
A TV B MAGAZINE C DEALER D NEIGHBOR E RELATIVE OTHER (SPECIFY)

24. INFLUENCED TO PURCHASE BECAUSE OF
A DEALER SERVICE B PAST PERFORMANCE MF TRACTOR C TV OTHER (SPECIFY)

25. FEATURES LIKED MOST IN ORDER OF PREFERENCE:

26. ITEMS DISLIKED, MOST OBJECTIONABLE LISTED FIRST:

27. OWNER COMMENTS:

28. DEALER COMMENTS:

29. PROBLEMS ENCOUNTERED AND SUGGESTED CORRECTION:

30. REPORTER COMMENTS:

31. DEFECTIVE PARTS BEING RETURNED TO:

D. ENG. 60
REV. 8-26-65

i.e., degree of reliability, of the entire production lot.

To understand this concept it may be helpful to look at (see following page) a typical curve representing the distribution of failures of a typical assembly plotted against time. This is sometimes referred to as a bell-shaped curve. If one tests a large number of samples of any part or assembly, one may expect to get a distribution similar to the dashed curve. The curve for any lot of components may be flatter or more peaked than the dashed one shown, or it may be skewed to the left or right.

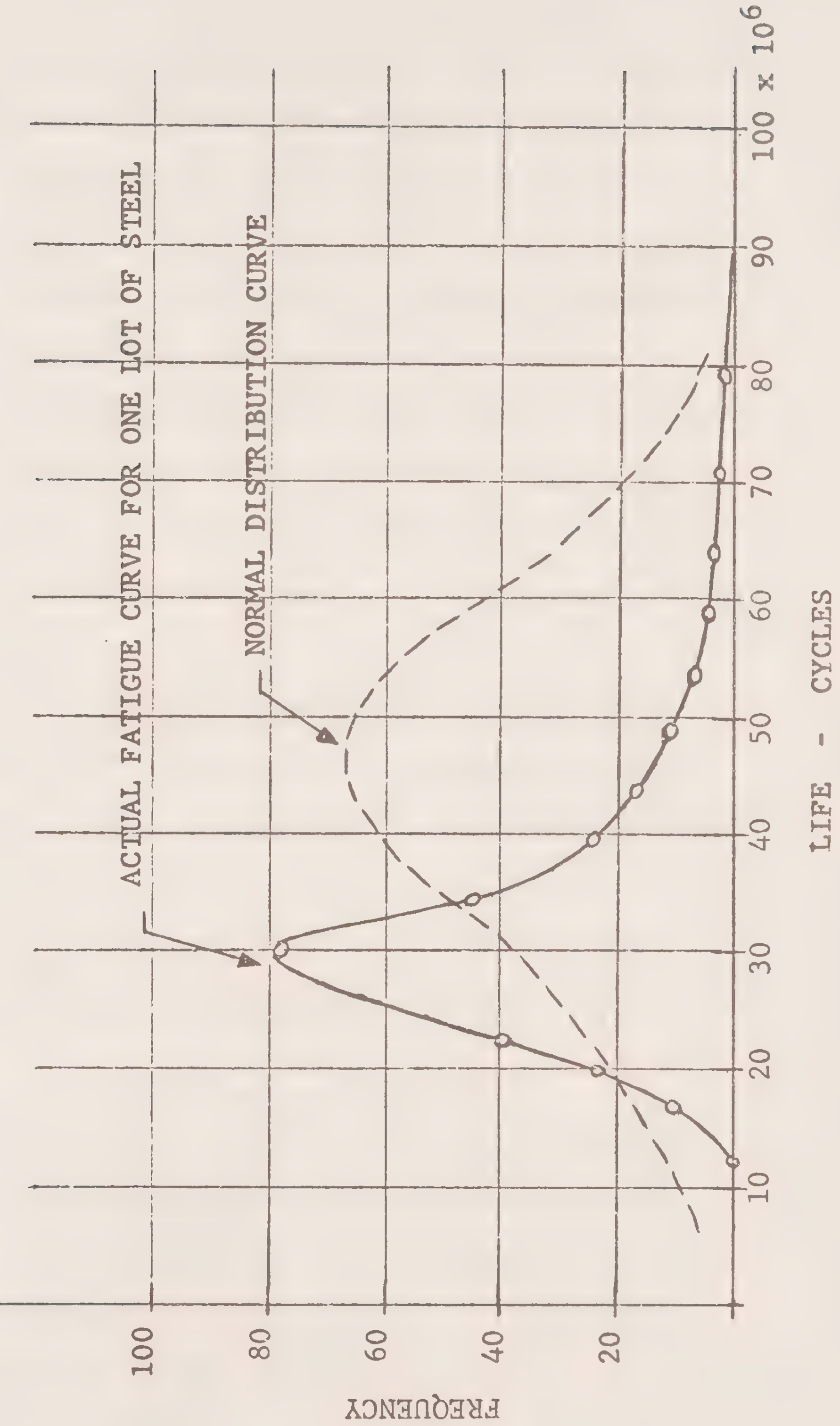
The important point is that a wide range exists in cycles-to-failure in most components. The particular curve shown is one of the fatigue life of a type of steel. Looking at the curve, it may be easily seen that fatigue tests on one or two components could not possibly establish a basis to predict reliability of the production lot in question.

The number of samples tested from any production lot of components establishes the "confidence level" which may be assumed, according to statistical probability theory, with regard to the reliability of the group of components from which the sample lot was selected.

What is meant by "confidence level"? If a lot of transmissions contains 20 transmissions and all 20 are tested with four failures, it can be said with 100 percent confidence, that lot is 16/20 or 80 percent reliable.

IX

FREQUENCY CURVE OF FATIGUE LIFE



If a second lot of 20 transmissions is tested with one failure, the reliability on that lot is 19/20 or 95 percent, and again the confidence level is 100 percent.

Massey-Ferguson, however, cannot afford to test every transmission it builds. Suppose the first group of 20 transmissions tested were part of a large production run, i.e., 1000 or more, what reliability can be expected and with what degree of confidence? Based on statistical tables, the actual reliability is between 64 and 91 percent with a confidence of 80 percent.

If it is desired to establish with 80 percent confidence that a production lot will in fact meet its specifications with 95 percent reliability, then 31 samples must be tested, all of which must pass the test.

Note: $$\text{Sample Size Required} = \frac{\text{Log } (1 - .80)}{\text{Log } .95} = 31$$

Thus statistical tables can pinpoint how many sample components must be tested to establish reliability at a desired confidence level. But reliability tests are expensive. Therefore, judgment is essential in determining which components to test. MF engineers select parts and assemblies for reliability testing when:

- they are manifesting continuing field problems;

- the warranty costs would be high if the components were unreliable;

- failure would cause the machine to be inoperative for an unacceptable length of time;

- failure might result in injury to the operator;

- the cost of reliability testing is low compared to the factory cost of the unit, i.e., less than one percent.

An example of such reliability testing is the fatigue test for an axle shaft. The test involves six axles from each production lot of 1,000. Each of the six must withstand 48,000 applications of a torque of 185,000 inch-pounds without a failure.

Another example is the reliability testing of chisel plow spring tines: 10 sample chisel plow spring tines from each batch of 1,000 are cyclically loaded between 0 and 82,400 pounds per square inch tensile stress. The minimum average life of the 10 specimens must be 200,000 cyclic load applications, with no specimen failures at less than 170,000 load applications.

The following page is an example of testing instructions for determining conformance to specification of the hydraulic pump in MF swathers.

In order to ensure quality control on vendor goods purchased by Massey-Ferguson for use and assembly in MF machines and implements, and to ensure that all such components conform to specification, and that they have been adequately tested and packaged for damage-free storage, MF requires a quality control certification from its suppliers.

Massey-Ferguson's own production quality control includes the following:

Metallurgical testing: the primary functions of the metallurgical laboratory include the grading and testing of bar stock from all foundry sources; structural examination by photomicrograph, X-ray diffraction, or other approved means of vendor and MF products; failure analysis of Massey-Ferguson products; process control of set-up welds, heat treatment, plating or other processes, through control of process variables and evaluation of sample parts; and standardization of equipment and procedures to conform to the latest American Society of Testing Materials methods.

Chemical laboratory: the primary functions of the chemical laboratory

RELIABILITY TESTS

All reliability testing shall be conducted with oil per MF Spec. No. M-1116 and with the pump and related components assembled in accordance with MF drawing 165 741 M91, Sheet 1. The oil temperature shall be maintained at 150° - 180° F and the pump input shaft speed shall be 2200 RPM. Driving belt tension shall be 150-180 lbs.

Failure of pump is defined as any malfunction rendering the pump inoperative or any deterioration causing decrease in delivery exceeding 10% of original delivery.

INITIAL QUALIFICATION TEST

Initial reliability qualification, established before assembly of pumps into production machines, shall consist of the following two tests:

1. Short Term Test

   Twenty pumps from the first production batch of not more than 1000 pcs. shall be subjected to 5000 cycles during which the pressure shall be varied between 150 PSI for 5-7 seconds and 1500 PSI for 1. 5 seconds.

   If two or more pumps fail, the entire initial production batch shall be rejected. If one of the 20 pumps fail, the initial shipment shall be withheld until an additional 20 pumps have been tested. If any pump in the second 20 piece sample fail, the entire batch shall be rejected.

   NOTE: Those pumps which successfully complete the 5000 cycle test may be used in production after reverification of compliance with all continuing control performance requirements for new pumps.

2. Life Test

   Concurrent with the short term cycle test above, two pumps from the first production batch shall be cycled to 66, 000 cycles each. In this test, the pressures and cyclic rates shall be the same as in the short term cycle test. Reject the batch if two failures occur in 66, 000 cycles.

   One failure in the first two samples necessitates testing 4 additional pumps from this same initial batch, again to 66, 000 cycles each. If one or more additional failures occur in this second phase of testing, reject the batch. Accept the batch with only one failure in the total of 6 pumps tested.

In the event of rejection of the initial production batch on the basis of failure to meet either of the above requirements, all pumps shall be quarantined until appropriate rework or other corrective action has been accomplished and pumps have been resampled, tested and qualified in accordance with Section 1. and 2. above.

include the analysis of incoming raw materials; control of processing solutions and paint; operation of corrosion testing equipment and examination for failure analysis where chemical means are employed.

Receiving inspection: vendor products, including all purchased parts raw castings and forgings, bar stock, tubing, sheet, coil, powdered materials, hydraulic pumps, valves and cylinders, etc., are inspected for conformance to an established Massey-Ferguson statistical sampling plan. Products inspected not meeting Massey-Ferguson specifications are rejected. These inspections are routine regardless of the requirement for vendors to certify the quality of goods which they sell to MF.

All steel bar stock is color-coded for chemical identification. All steel bar stock from warehouses, or materials which are of special chemistry or high carbon, or materials which are not provided with certification of analysis, are sampled and identified by receiving inspection. The sample is sent to the laboratory for chemical and/ or metallurgical analysis.

Materials must be as specified in accordance with Massey-Ferguson standards. Such standards require analysis within chemical or harden ability limits and analysis for control of maximum allowable amounts of slag, inclusions, decarburization, pipe, heat scale and core sand. MF's receiving inspection also establishes evidence of

proper heat treatment, tensile strength, yield strength, elongation, forging flow patterns, resistance to heat or hydraulic oils, shock load resistance, fatigue, functional tests and proof and burst test of hydraulic lines.

In-process inspection: machined, stamped, formed, welded and assembled components produced within the facilities of Massey-Ferguson receive the following quality control inspections:

- "first off" approval: all components set up and ready for production are submitted to quality control for a "first off" dimensional approval. Components are checked and, when found in conformance with specification, are approved for production and tagged with a "first off" approval tag which identifies the part number, operation number, date. An inspector signs the tag to authorize the parts' use in production;

- patrol inspection: components previously approved for production by "first off" approval are again checked by a patrol inspector at regular intervals to insure that components being used in production conform to specification. Any components found not meeting blueprint specification cause production to be halted and the initiation of a sorting or rework program to eliminate substandard components;

- audit inspection: finished machined, stamped, formed and welded lots of components routed to the stockroom receive a final audit inspection. Lots not meeting specification are returned for rectification.

Final run off: inspection at the final assembly of completed machines such as tractors, combines, corn heads and balers includes a complete check covering all functions of the machine.

Final set-up: stripped down and bundled implements shipped by Massey-Ferguson factories for dealer assembly are built up and inspected completely by quality control inspectors. This ensures that all the machine's components have been packed and that the dealer will receive the complete machine as ordered.

Machine audit: complete machines are audited by quality control on a random sample basis in the shipping area. Pre-delivery inspection checks again ensure that the dealer and his customer receive complete machines to specification as ordered and ready for field use, if applicable.

Endurance and Performance Testing by the Quality Control Centre

This testing confirms the performance and durability characteristics specified for each new machine. The testing takes place under controlled laboratory conditions. Similar testing is conducted on

critical functional components, or even on the entire machine, of models in current production. Metal fatigue tests, for example, involve the flexing of castings, welds and sheet metal through the rapid application of severe field loadings.

Performance testing also includes the periodic reassessment of power outputs, fuel consumption, etc.

As a measure of the importance MF attaches to the function of its North American Quality Control Centre the company is now in the process of doubling the centre's staff of technicians to 14 and adding two additional professional engineers for a total of six.

Advanced Testing Techniques

As indicated earlier, MF has been improving its ability to more sufficiently encompass in laboratory testing --particularly in the earlier stages of machine development-- the effects of various field conditions and operations on the increasingly complex machinery which the farmer requires today.

In short, the company was not satisfied with its ability to predict a machine's performance. Consequently, over the last several years, MF engineers have been developing and applying advanced methods and techniques in order to more realistically simulate actual field conditions and the reaction of experimental machines to them.

The basis of these advanced techniques is the actual electronic recording, in the field, of a machine's reactions to any number of conditions encountered there. The machine is "wired" to a magnetic tape recorder. A single tape can simultaneously record on 16 channels, providing a record of the frequency and levels of speeds, stresses, strains, vibrations, temperatures, energy levels, number of gravities, hydraulic reactions, bounces and any other loads one wishes to measure. In addition, there is a verbal channel on which the operator can narrate the conditions he observes or state what maneuver or operation he is putting the machine through.

Tapes recorded in the field are returned to the engineering laboratories where analysis reveals the correlation of the machine's reactions, one with another as well as with the various loads and machine maneuvers and operations which have caused these reactions.

In order to conserve laboratory time, tapes are normally converted to an artificial time base. Essentially, this means condensing or shrinking the length of time required to play the tape without altering its information content or altering the internal relationships of the data recorded. The ratio of real time to artificial time varies from 1:1 to 1:100-plus. The ratio selected depends on the later use planned for the tape and whether or not an artificial time base would distort the reactions of an experimental machine being controlled in the laboratory by the tape.

Beyond the obvious benefits of more realistic testing, there are significant cost advantages to the company's advanced techniques. These result largely from accelerating the developmental testing cycle through (1) having a taped "library" of actual field experience on hand to play against any appropriate machine and (2) through shrinking time absorbed in laboratory testing by converting field experience tapes to an artificial time base.

Also, to the extent that the field tapes more validly reflect field conditions than theoretically calculated conditions sometimes used previously, cost savings result through the adjustment of component specifications which will obviate later warranty or rectification costs; or, conversely, the company may be able to use less expensive components when it can demonstrate that earlier theoretical assumptions have led to "overbuilt" components.

In the past, laboratory testing of machines has been based largely upon strain gauge measurements in the field or upon the theoretical calculation of forces the machine might actually encounter in the field. These forces were then translated into instructions governing laboratory equipment which would exert these forces upon the machine component in question.

If the theoretical calculations were based on somewhat unrealistic assumptions, the test results, of course, would correspondingly tend to be less than valid.

For example, it might previously have been assumed that the force applied to the leading edge of a cutter bar when it strikes a 50-pound boulder at three miles an hour would be 25 pounds per square inch. Laboratory tests of components would be based on the criterion that the cutter bar must be able to withstand perhaps 200,000 blows of such force. Tapes recorded in the field, however, might reveal that the actual force is 22 or 27 pounds per square inch.

The field tapes, appropriately converted to an artificial time base, are used in the laboratory to control dynamometers. These dynamometers apply the exact loads to the laboratory test machines or components that were actually encountered in the field.

If such tests reveal an unsatisfactory component condition or reaction, the component's specifications are upgraded. These specifications are the basis for the manufacture of both the components which MF produces and those which it purchases. The North American Quality Control Centre, of course, tests production components against these same specifications.

Massey-Ferguson is using these advanced techniques increasingly in

machinery development. The company's engineers, as yet, have not accumulated sufficient data to establish the true value of these techniques. However, an indication of the importance attached to their potential is the fact that this year the program, which now includes tractor, combine and baler testing, is three times as large as last year. Next year it will grow even more.

Security

The company considers its test data to be confidential information with obvious competitive implications; therefore, data developed during testing are not made public. The company believes they would be of no practical significance to customers.

The Nerve Centre

This is a computerized communications and data processing centre in Detroit. It is used to help control the company's day-to-day, minute-to-minute operations in North America. It provides many services and capabilities which enable MF to react with great speed to many engineering, manufacturing and marketing situations. The computer enables company engineers and others to store and retrieve information in many significant forms. It also facilitates the use of this information for predictive purposes.

The company now routinely uses its nerve centre for the receipt and processing of information:

- on a daily basis from testing done at MF's experimental farms;

- generated by farmers cooperating with MF in the evaluation of pre-production models;

- on newly introduced production model machines.

This information, once processed, is at the engineer's disposal for many purposes. He can retrieve it on an incremental or an accumulative basis. He can direct the computer to cross-tabulate various categories of data it contains. These categories include field testing, customer use evaluation and new production model performance data by machine, by geographic area, by crop type, by soil type. The computer can also compare the field results against laboratory results.

Overall, the centre can provide the engineer, on a daily basis, with meaningful test and evaluation data from throughout North America. And it can compare various categories of these data in ways to meet his professional needs.

As mentioned above, the centre receives information from the field on newly introduced production model machines. This is part of a specialized engineering-manufacturing-marketing field surveillance and product improvement program introduced last year.

Here is how it works: field survey teams, each headed by a professional engineer, tour specified territories questioning users of new MF equipment, looking for problems before they occur. The teams report long distance each night to the nerve centre. There the reports are taped, transcribed, coded, programmed and fed to the computer. The computer, by projection on a Weibull probability curve, pinpoints problem areas in an early stage.

The next step is immediate notification of all concerned and is followed by engineering, manufacturing and/or field modifications, as appropriate. This is a new program and has produced gratifying results to date.

SAFETY

Massey-Ferguson engineers, through their design of the company's farm machinery, have a principal role in MF's continuing efforts to provide the farmer with equipment which can be operated with minimum hazard. However, safe machinery is no guarantee of safe operation. Safe operation, to be sure, demands provision of well designed machinery. But only the farmer's own habits and attitudes will produce safe operation.

Under normal circumstances and operating conditions, the company believes that its machines are safe. Tractor design, for instance,

is intended to provide optimum usefulness to the farmer and to give him the power he needs in the safest possible manner.

Consequently, at every stage throughout the entire development and testing cycle described earlier, design and performance criteria incorporate safety factors for the protection of the farmer. These include both (1) basic design of the equipment itself, e.g.,shielding of moving parts, avoidance of dangerous protrusions and (2) the application of human-factor engineering principles. These human-factor principles enable MF engineers to design machines that fit the operator's limitations and integrate him with the system he controls.

With reference to the first category, physical improvement of machinery is an area of constant study and innovation. Oftentimes, important safety devices are not dramatic and consequently go unheralded; for example, properly placed hand grips, non-skid platform surfaces, safety lights, cushioned and spring-loaded seats with back support, positive transmission parking locks and low-elevation fuel tanks. More visible and more dramatic are roll bars and safety belts which are available on all MF tractors.

Shields and guards for revolving shafts, belt-and-pulley trains, gear trains and train drives which would otherwise be exposed have long been standard equipment.

Prominent warning decals are affixed to appropriate places on the machines warning the operator to shut off power before removing shields or housings to make adjustments and before clearing clogged portions of the machine, etc. Warning lights (varying by province and state) and slow moving vehicle signs for highway travel are standard equipment.

Shields are of particular importance in the protection they afford farm machinery operators for they are used to surround or otherwise separate the moving member of the machine from the operator.

The MF300 combine, for example, as standard equipment has the following safety shields:

- table drive;
- reel drive;
- motor;
- grain pan drive;
- rethresher drive;
- clean grain auger drive;

- distributer auger drive;

- unloader drive train;

- vertical auger drive gear;

- unloader distributer positioning gear;

- horizontal auger drive chain;

- variable speed cylinder drive pulley;

- straw walker drive.

<u>None of these shields, however, afford the operator any protection if they have been removed.</u>

Removal of shields from various types of agricultural machinery, apparently in the interest of facilitating maintenance, is common practice. Indeed, a recent study by the Institute of Agricultural Medicine at the State University of Iowa showed that 67 out of 100 tractor power-take-off accidents studied occurred because one or more of the manufacturer's shields were missing or had been removed.

One expert in agricultural accidents, L. W. Knapp, Jr., chief of the

accident prevention section of the institute which conducted the study referred to above, states:

> "The unique accident which fits the occupational accident category in the strictest sense is associated with agricultural equipment that is, in general designed to grasp, cut, pound, pull or shake agricultural products in such a manner as to render them usable to the farmer. This equipment, which is powered by electrical or gasoline motors ranging in size from a fraction of a horsepower to hundreds of horsepower, <u>cannot be expected to be selective in its operation if hands, fingers or feet become entangled in their actions.</u> It is because of this necessity of reducing vegetable matter into small pieces that agricultural accidents rank near first place among all types of accidents with respect to the severity of associated trauma. The tractor overturn, the power take-off accident and the corn picker accident are all examples of this category". (Editor's underlines.)

Another expert in agricultural safety, Dr. Norval Wardle, extension safety specialist at the Iowa State University, states:

> "Many farmers do not realize that the tractor is changing. The tractor is becoming far more complex. Experienced

tractor drivers often do not know enough about the tractors they are operating, what the machine will do under stress conditions, and just what its limitations are.

"They forget that the tractor always does what the operator tells it to do through its controls.

"Most farmers buy a tractor and take it home and head for the fields. They do not realize that their purchase was not confined to the tractor, but that it included knowledge about the machine. (See chapter V, page 74.)

"The dealer owes it to the farmer to make sure that he is buying knowledge as well as a tractor and that his customer knows as much as possible about the machine and its operation."

Massey-Ferguson believes that its role includes helping the dealer to so educate the farmer. To this end the company:

- stresses safe maintenance and operation of machinery and proper use of safety features to dealers and their service and sales personnel attending North American training centre courses;

- stresses the same points in operator's manuals; and through other written communications with dealers and farmers, e.g., FARMING TODAY, distributed to 150,000 Canadian farmers;

- stresses safety information in its face-to-face communications with dealers and farmers through the company's district managers;

- cooperates, both on its own and through the Farm and Industrial Equipment Institute, with rural youth and dealer groups in development, financing and promotion of programs which, applied locally, increase farmers' knowledge and appreciation of good safety practices;

- is one of the charter members of the Saskatchewan Safety Council, which MF has helped support since its founding.

All these efforts notwithstanding, farm machinery accidents still persist; in fact there is some evidence they are on the increase. Massey-Ferguson's concern with this situation was expressed publicly last fall in the following remarks by its North American marketing director (beginning on the next page).

THE ATTACK ON AGRICULTURAL ACCIDENTS:

THE MISSING INGREDIENT

Iowa Association
of
Mutual Insurance Associations

November 15, 1966

L. H. POMEROY
Vice President Marketing
Massey-Ferguson Inc.

TO: Iowa Assn. of Mutual Insurance Associations
Des Moines, Iowa
November 15, 1966

BY: L. H. Pomeroy

Thank you Mr. Higgins. Good afternoon ladies and gentlemen. I am happy to be here today. Your invitation gives me the chance to discuss some matters which I believe are of concern to you and which I know are of concern to the company and industry I represent. I refer to the problems of rural or agricultural health.

You have a vital interest in these matters, first, because of the leadership each of you furnishes your own community; secondly, because many of you are actively involved in farming; and, thirdly, because of the viewpoint you, as members of the insurance profession, must take toward hazards to rural health.

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Catastrophe, whether natural or induced by man himself, has, in large measure, been responsible for the emergence of formal insurance programs. The principle of insurance is stated simply: spreading the risk in order that a society can provide its members protection which they cannot provide for themselves individually.

In recent times, a second principle has been added: the minimization of the risks themselves, usually through educational programs and technological and medical advances. In these educational programs, the insurance industry has furnished substantial leadership.

Compared to farming, only mining and construction work are more dangerous occupations from the standpoint of the number killed per 100,000 workers. Howard Pyle, president of the National Safety Council recently stated that because of -

> "...fire hazards, ponds and water ways, medicines for the treatment of livestock, insecticides and firearms the potential for accidental death and injury on the farm is unusually high. More often than not, emergency medical care is not immediately available which almost invariably compounds the consequences of an accident."

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According to the U. S. Department of Health, Education and Welfare, nearly 2,300 farm fatalities occurred in the U. S. in 1964. Of these, 875 were farm machinery-related. Other causes, in order of declining significance are: drownings, firearms, falls, blows from falling or projecting objects, animals and insects, burns, electric current, poisoning, lightning and miscellaneous causes.

Both fatal and non-fatal accidents obviously cause much suffering for the families of the injured or deceased.

Such misfortunes, in an economic sense, are also extremely wasteful. Government statistics show there were approximately three-quarters of a million fatal, permanently disabling or temporarily disabling accidents from all causes to our farm population last year. Mr. Pyle estimates the total cost to farm families at $1.8 billion. If you assume that the average food-producing person is incapacitated for one year, this means a loss each year of enough food to feed more than eight million people.

For all these reasons the safety aspect of rural health must be considered a problem of major proportions. I hasten to add my belief that a high percentage of these accidents is preventable.

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Perhaps the first step in determining "how" is the consideration of the nature of hazard -- whether the hazard is manmade or an element of nature. It has been my observation that accidents often arise from one of several mental conditions. The simplest of these is lack of knowledge. Lack of knowledge means that the human simply is unaware that his environment contains elements which can injure or kill him. The next mental condition is probably inattention or misdirected attention. The toll of these two conditions, lack of knowledge and inattention, is perhaps somewhat reduced by normal training and experience.

The third condition is subtle and insidious, for it selects as victims those who possess knowledge and skill in considerable degree. I refer to the protective fatalism of those men who habitually function in an environment with strong elements of hazard.

These men are really not so much concerned with facts, but usually believe, and act on, what is most accommodating and least threatening.

For instance, a recent study by the Institute of Agricultural Medicine at the State University of Iowa shows that 67 out of 100 tractor power-take-off accidents studied occurred because one or more of the manufacturers'

shields were missing or had been removed. To me this suggests that of these 67 farmers some believed they enjoyed a mystical immunity to injury.

Farm equipment manufacturers are concerned with health hazards to the rural population. This is not to say that we have yet done all that can be done, but in our own area of specialization we are accelerating our efforts.

Fortunately, we are far from alone. There are literally scores of organizations, institutions and clubs which are contributing in some degree to the improvement of rural health -- particularly through safety education.

In my opinion, the diversity and multiplicity of these groups, in the absence of a continuing, formally recognized body for central coordination of their efforts, is a detriment to the effective application of all the forms of safety know-how these groups possess.

These many organizations certainly represent those in the agricultural community with the prime interest in and responsibility for the improvement of the rural health scene. It strikes me as reasonable that the executive membership and professional staffs of the existing groups could supply the nucleus for such a coordinating agency.

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Another of the apparent basic shortcomings in the field of rural safety is the absence of meaningful analyses and definitive studies into the causes and effects of farm accidents. L. W. Knapp, whose work at Iowa's Institute of Agricultural Medicine I mentioned a moment ago has stated the need to accelerate and increase this kind of research. I fully agree. Such studies are the best guarantee that our individual efforts to eliminate hazards to rural health are not wastefully duplicated elsewhere.

Let me attempt to illustrate for you a few of the many aspects which must be considered in connection with just one segment from the total rural health spectrum. Let's examine the question of the relationship between the people who suffer fatal, machinery-related accidents and those peoples' age and experience.

Of the 875 people who died from such accidents in 1964:

- 15 percent of them were under 15 years of age;
- 8 percent were 15 to 19;
- 20- to 24-year-olds accounted for 4 percent;
- 25- to 44-year-olds accounted for about 17 percent;
- 45- to 65-year-olds accounted for 36 percent;
- and people over 65 added the remaining 20 percent.

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It is interesting to note that the 45-to-65 year-olds, who represent approximately one-quarter of the male farm population, were involved in more than one-third of these accidents; similarly, but with even a worse record are the males over age 65. They are 10 percent of the male farm population but they accounted for 20 percent of the fatal machinery-related accidents.

What does this suggest in relation to my basic question? Perhaps the most obvious answer is that a higher percentage of the people left on the farms are actually using the equipment; perhaps the nature of the machinery itself now demands more operator instruction and skill; perhaps those left to use the machinery are actually using it a greater absolute number of hours to increase production; and perhaps the total flow of younger individuals from the farm to the city has substantially altered the age composition of the remaining farm population, placing a greater burden of work on older men.

It would seem that of prime operators the 20 to 24 year age group is the safest. And it would also seem that the experience and skill of the 45 to 65-year-olds is not serving to provide them with the immunity from accident some people think comes with age and weathering.

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But to those complexities we must add some further considerations. Statistics indicate that fully a quarter of the people involved in tractor accidents in the six years 1960 through '65 did not even live on farms; and only half of those involved were adult farmers or farm employees. One-third were pre-school children, students or housewives.

While it might be possible to draw some tentative conclusion about the lack of skills or judgment of some accident victims and the advanced age of others, that is not my purpose. My purpose is simply to suggest the complex nature of just this one segment of the total hazard-to-rural-health problem. And to suggest the desirability of a single agency to serve as the nerve center in marshalling agriculture's resources against these complexities.

It is also my intention to make the point that while these statistics may mean different things to different people, there <u>is</u> agreement of expert opinion on the basic factors involved in machinery accidents. Most safety experts recognize three such factors: the operator, the machine and the terrain. And it is interesting to note that available studies suggest that terrain and unsafe operating practices are the <u>prime</u>

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factors in farm machinery accidents, exceeding by far mechanical fault or unsafe features of the machine.

For instance, in the 1960-65 study I mentioned a moment ago, embankments and inclines contributed to 55 percent of the accidents. Many safety experts also add a fourth factor -- the safety consciousness of the operator himself.

The physical improvement of our equipment is, of course, an area of constant study and innovation for us. Oftentimes, however, the most important safety devices are the least dramatic. For instance properly placed hand grips, non-skid platform surfaces, flashing safety lights with amber lenses, cushioned, spring-mounted seats with back support, positive transmission parking locks and low-elevation fuel tanks. More visible and more dramatic are roll bars and safety belts which will be available on all our tractors next year.

But, in my opinion, the most important design and engineering safety improvements are those we incorporate in the <u>basic</u> design of tractors and implements. Some of these I've just mentioned. They often go unheralded and perhaps unnoticed.

These improvements result from our application of human-factor engineering principles at the design stage.

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They enable us to design our machines so they will fit the operator's limitations and integrate him with the system he controls. They also reduce his fatigue and help reduce the chances for operator error.

This is just one way our engineering is improving the safety of our equipment. Massey-Ferguson is devoting half a million dollars this year to a very specialized engineering-manufacturing-marketing technique which we expect will be fruitful in reducing accidents. This is a field surveillance, safety and product improvement program. It is now a part of the operational system which controls the company's day-to-day, minute-to-minute operations.

Here's how it works: field survey teams, each headed by a professional engineer, tour specified territories questioning users of our equipment, looking for problems before they occur. The teams report long distance each night to our nerve center in Detroit. There the reports are taped, transcribed, coded and programmed for our computer. The computer by projection on a Weibull probability curve can pinpoint problem areas while they are still in the embryonic stage.

The next stage calls for immediate notification of all concerned and is followed by engineering, manufacturing

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and/or field modifications, as appropriate. This is a new program. We are pleased to date with its results. And we are learning every day how to use it more and more effectively. We believe it has implications for many manufacturers in this country and abroad.

Gentlemen, I've tried to cover much ground very fast. The problems of rural health are very real. I think we all agree that they must be reduced to a minimum. I hope that my remarks have given you a clear indication of our recognition of these problems and how we think we can most effectively combat them.

I believe the obvious first step in meeting this national need is a central coordinating body to function as a clearing house for all the research and action programs directed against hazards to rural health. Both research and action programs demand highly skilled people. Without a recognized body with the prestige to influence the direction of research and action programs, and to assist in the communication of results, a wasteful duplication of effort will persist.

Both the economic and human consequences of hazards to rural health are too profound to tolerate. The formation of a body to coordinate the attack on rural health hazards, will be a strong first step in hastening their control.

Thank you.

In his remarks the director marketing draws attention to the scores of organizations which are contributing in some degree to the improvement of rural health. This does not, in MF's opinion, mean that additional organizations cannot contribute or participate, or that more activity cannot or should not be undertaken. Indeed, it would seem to MF that the expansion of such activities by rural organizations, particularly farmers' and dealers' groups, would be a natural extension of their present activities in their own interest.

The need for such expanded activity by agricultural organizations is evident in the attitude of farmers as expressed by the executive secretary of the Alberta Federation of Agriculture who in March stated before this Royal Commission:

> "This business of safety, we all talk about it and we are all in support of it but when it gets down to brass tacks there are a lot of us pretty careless about it. I think, if you were to say, 'Well, the roll bar is compulsory', there would be a certain amount of opposition. Now, just as an example, right now our farm organizations and our farm people generally have supported the idea of this slow moving vehicle and I understand now that it has been brought into legislation within the province and I am not so sure but that you wouldn't find a lot of criticism: 'Well, I've got to go to the expense of this and I've got to go to the trouble of that!' It is one of those things

we talk about and when the chips are down, many of us try to dodge it."

A slightly different viewpoint was expressed by the president of the Farmers' Union of British Columbia when queried by the Commission:

"...I think...that farm safety, of course, is the responsibility of the individual in more cases than not. I believe that machines have adequate safety devices...

"...I believe that a lot of farm machinery...is used where it isn't proper to use this type of equipment. (Editor's note: this is a reference to slopes of ditches.) It hasn't been designed for this type of use and, therefore, it is unsafe. However, I believe agricultural equipment, in doing the job it was designed to do, is certainly safe..."

Regardless of action, or lack of it, on the part of other members of the agricultural community, Massey-Ferguson intends to continue its engineering and communications efforts toward the improvement of rural health and specifically toward the reduction of accidents involving farm machinery.

ECONOMIC ADVANTAGES THROUGH ENGINEERING

MF attempts to minimize engineering/manufacturing costs through its "value engineering" program mentioned earlier. Under this program each product is examined to determine where and how material and manufacturing expense can be reduced without sacrificing the performance or durability of the machine. This program --one way in which MF attempts to control cost increases-- has itself cost close to $1 million in the past two years. MF believes, however, that the program has at least paid for itself.

Tractors

The evolution of the MF135 gasoline tractor over the past six years illustrates the improvement of the machine's efficiency and suggests the heightened productivity the farmer can achieve using it. In 1961 the MF35, as it was then known, was sold as a two- or three-plow tractor with a 33 power-take-off horsepower rating. Today the MF135 is rated at 35 PTO horsepower and it offers the following technical advances:

- new dry air cleaner (standard equipment) while adding slight cost to the gasoline model, actually reduces the cost of the diesel model. This air cleaner improves filtering of dust-laden air, thereby prolonging engine life;

- triple-lip wheel seals (standard equipment) prolong the life of the expensive front wheel bearings;

- strengthened lift-linkage system (standard equipment) accommodates the larger implements now in use. By increasing the strength of the top cover casting and the lower links, and improving bearings and lubrication, the normal life of the lift-linkage was increased 300 percent;

- aluminized muffler (standard equipment) doubles muffler life;

- electro-luminescence lighting (standard equipment) incorporates more durable components, improves visibility and eye comfort;

- new perforated grille (standard equipment) not only improves appearance but provides better protection against materials which can plug radiator cores and cause overheating. It eliminates the need for frequent cleaning;

- hydraulic system pressure increased from 2500 to 3000 psi (standard equipment) enables the tractor to accommodate larger capacity and heavier implements;

- Multi-Power transmission (optional) provides an increased work output. On-the-go shifting prevents stalls and permits optimum operating speeds by doubling the available number of ground speeds;

- differential lock (optional) allows the operator to lock the rear wheels together. This allows tractors to operate in wet ground conditions;

- spring suspension seat (optional) provides greater operator comfort and reduces fatigue;

- heavy-duty swinging drawbar (optional) accommodates larger implements;

- independent power-take-off (optional) improves facility and efficiency of power-driven implement operation under adverse conditions;

- Pressure Control hitch (optional) which transfers weight from semi-mounted and pull-type implements to the tractor's rear wheels.

Value added by the new standard features is conservatively estimated at $175. The additions of the standard items indicated were made for a variety of reasons. The $175 value added figure are engineering estimates based on material and production costs. There is no way to quantify the value of these standard features to the farmer. The consumer purposes they serve are indicated with each change.

The f.o.b. factory prices of an MF35 gasoline tractor in 1961 was $2,668. The comparable MF135 tractor in 1966 was priced f.o.b. factory at $3,061. (The actual 1966 price to the Canadian farmer, in addition to freight charges, included a surcharge of $141.42 to compensate for the effect of the 1962 devaluation of the Canadian dollar.)

The price differential over the five-year span, after allowance for the $175 value added, is 8.2 percent. From 1960 to 1966, according to the Dominion Bureau of Statistics Canadian Statistical Review monthly averages for those years, the industry selling price of agricultural implements rose 9.3 percent. For the same time span, the general wholesale index increases, based on monthly average figures for the years 1960 and 1966, were 10.8 percent for non-farm products, 17.0 percent for iron and non-ferrous metal products and 11.1 percent for fully and chiefly manufactured goods. According to the same source, average hourly earnings in manufacturing increased 26.4 percent. And the average gross hourly earnings of MF's Canadian wage employees rose from $2.35 in 1960 to $3.34 in 1966 --an increase of slightly over 42 percent.

A comprehensive discussion of certain additional factors that have influenced the costs and selling price of machinery is included in chapter VI.

Combines

There have been numerous improvements in combines over the years. As stated earlier, the development costs for the MF410 self-propelled combine were $1.7 million. This combine, introduced in 1964, is considered the replacement machine for the MF92/Super 92. The MF92 had 4,588 square inches of separating area; chaffer and cleaning areas of 1,384.25 square inches each plus a chaffing area extension of 294.38 square inches. The machine weighed 9,420 pounds. The MF410 has 6,240 square inches of separating area; chaffer and cleaning areas each of 1,384.25 square inches plus a chaffing area extension of 316.75 square inches. The machine weighs 9,950 pounds. The changes and their advantages, offered with MF410, or since incorporated in it, are tabulated below:

- the 292 gasoline engine and A4-300 diesel engine provide increased horsepower;

- knife speed increased and drive mechanism strengthened to provide clean cut, reduce jamming and increase life;

- knives chrome-plated for longer life;

- instant table disconnect capability incorporated to avoid machine damage from operating hazards;

- hydraulically controlled reel height incorporated for ease of operation and precise adjustment to varying crops and terrain;

- reel speed made variable to better suit different crops and crop conditions;

- improved machine stability on slopes achieved through reconfiguration of wheels and machine; also allows row crop work without damaging standing crop;

- rear wheels aligned to follow in track of front wheels; improves steering control in muddy conditions;

- simplified hydrostatic steering increases ease of maintenance;

- width of machine adjusted to conform with requirements for highway transportation;

- variable speed cylinder drive and speed indicator provided for more precise control of threshing;

- machine stability increased through low silhouette, saddle-type grain tanks; operator can sequence tank use to cope with terrain variations;

- horizontal, pivotable unloader spout introduced to increase ease of off-loading; controlled by operator from seated position;

- unloader spout extension permits unloading at greater distance from elevator bin;

- fuel tank position lowered to provide greater stability and ease of filling;

- engine positioned atop machine for easier maintenance access;

- a main power countershaft, delivering power to both sides of the machine, placed behind engine; new position permits simpler drive design, maintenance and repair;

- rotating radiator screen added to reduce clogging and improve cooling;

- improved engine cooling and carburetion achieved by mounting precleaners at highest point on machine; this provides cleaner air plus improved monitoring by operator;

- hinged platform ladder provided to eliminate possible damage to standing crop;

- vertically and horizontal adjustable seat added for operator's comfort; swings completely away if operator wishes to stand;

- tool box added within easy reach behind operator;

- control panel visibility improved;

- integrated relationship of controls heightened;

- shield and walker area designs standardized to conform with Farm and Industrial Equipment Institute recommendations;

- basic design altered to permit manufacturing efficiencies in building machine to grain or rice specifications; necessary elements strengthened for attachment of corn head;

- quick detachable corn head designed to speed conversion from corn to grain configuration;

- specially heat-treated bronze bearings used to mount reel shaft; increases bearing life and reduces replacement costs;

- unit assembly technique devised to improve manufacturing efficiency through simpler mounting of table and elevator to machine;

- provision of two-shaft straw spreader increases straw disposal capacity;

- malleable chain connecting elevator to cylinder replaced with steel roller type to increase life and reduce service requirements;

- horn provided to sound automatic warning if gleanings elevator gets plugged;

- four-speed gearbox and shift improves speed control in heavy crops;

- more precise speed control and ease of shifting achieved through hydraulic cylinder-pulley arrangement to vary drive belt ratios;

- automatic table height adjustment added to avoid possible damage while working close to ground, as with soy beans;

- telescoping steering column provided for improved operator steering control and comfort.

It is apparent that these engineering or manufacturing changes had varying justifications. Among them were improved machine efficiency, lower manufacturing costs, simpler maintenance requirements and increased ease of machine operation.

STANDARDIZATION

One of the practices partially responsible for MF's position today as the world's largest manufacturer of tractors and combines is its insistence on standardization.

The question of standardization has been raised by numerous earlier witnesses before this Commission. Massey-Ferguson believes it is worthwhile to clarify the various meanings of the term "standardization" which, as used by some, has occasionally been somewhat vague.

What is Meant by "Standardization"?

In the engineering sense, standardization means the stablishment and use of uniform processes, procedures and materials; it also means the interchangeability of machine parts or components.

With regard to the number of different types of parts, the term standardization sometimes refers to the reduction of the total number of similar parts in a machine. For instance, 57 nuts and bolts of slightly different dimensions in a tractor or combine might be "standardized down" to half a dozen.

Standardization: From a Single Manufacturer's Viewpoint

All of the above types of standardization might be considered internal from the standpoint of any one farm machinery manufacturer.

In Massey-Ferguson, they are all practiced for the economies they produce both in an immediate, ease-of-operation sense and, just as important, they are practiced because they are dictated by the practical demands of rationalization of MF's international manufacturing complex and the engineering resources which support it. Without component commonality, the company would automatically sacrifice much of the economic advantage of its internal component manufacture and cross-sourcing. However, it should be borne in mind that economic reality leads to an optimum level, rather than an absolute achievement, of standardization and interchangeability.

...From a Total Industry Viewpoint

With regard to the total industry, in contrast to the individual manufacturer within it, there are comparable levels or categories of standardization. Examples of industry-wide standardization, already achieved or in the offing are given in subsequent pages.

...And Beyond

Beyond these meanings, the term standardization has also been used to express the opinion that parts should be interchangeable not only among farm machinery models in one company but among all models of all companies. Indeed, the suggestion has been offered that farm machinery manufacturers be supplied designs and plans for fundamentally new machines by outside research and engineering institutions under government contract. Under such a suggestion the manufacturer would

still be responsible for design adaptations to production requirements.

Could Canadian Manufacturers Compete Internationally?

On the surface, such suggestions would mean, effectively, government entry into the business of engineering farm machinery; these suggestions also presuppose the necessary expertise. At the risk of over-simplification, were such expertise available, the farm machinery industry in Canada would then find itself competing solely on the basis of manufacturing and marketing efficiencies, for the manufacturers would have little or no control over the engineering quality of their respective machines. Conceivably manufacturers, if they wished to compete in the Canadian market, might find themselves forced to produce machines of inferior quality which could not satisfy consumer needs.

The basic suggestion for government-sponsored machine design apparently stems from a relative lack of basic or fundamental research sufficiently oriented to farm machinery engineering requirements. Data on optimum depth, temperature, moisture content, pressure, fineness and uniformity of soil, etc., it is suggested, would enable engineers to produce better designs for tillage and harvesting machines.

There may be some elements of truth in such suggestions. However, the argument is incomplete inasmuch as it implies that a small number of government designs would satisfy all Canadian agricultural conditions. The government-sponsored design suggestion, as indicated above, takes cognizance of the individual manufacturer's need to adapt such designs to its own production requirements.

The extent to which these adaptations themselves would have to be standardized to preserve the basic intent of the suggested program is a further question which shall go unanswered here. Massey-Ferguson shall comment, however, that it does not agree with the assumption that "outside" engineers who might contribute designs would possess engineering skills superior to those available from MF's engineering staff.

Overall, the arrangements suggested would rupture Massey-Ferguson's internationally integrated engineering structure and isolate Canada from the technological benefits flowing from that structure.

Inefficiencies through Overstandardization

It is not unreasonable, in the company's opinion, to suggest that "overstandardization" contains the seeds of more inefficiencies and detriments to progress than presently exist in what some view as a state of "under standardization". At some point in the drive to achieve industry-wide standardization, the abstract conceptualized

ideal of standardization would sacrifice worthy innovation to bureaucratic order.

Effect on the Farmer

The resultant inefficiencies would affect both the farmer and the company who share a continuing interest in economically practicable standardization. In terms of MF's present operation, standardization provides convenience and economies for both the company and the consumer through uniform processes, procedures and materials which reduce manufacturing expense in raw materials, labor and tooling. Parts and component standardization permit longer, more economical production runs and more manageable inventories. These translate into further economies through the resultant interchangeability and cross-sourcing of components between manufacturing centers, and help enable the company to price competitively for the benefit of the farmer.

Effect on the Company

Were independent research and engineering organizations responsible for machine design, and were the use of such designs incumbent upon the industry for machinery sold in Canada, Massey-Ferguson believes that a major dislocation of the integrated international engineering-manufacturing-marketing structure of this company would be inevitable.

When one considers the interactions of the engineering, manufacturing

and marketing functions required to satisfy customer needs it becomes evident that the suggested independent engineering organization would have to become involved with the manufacturing and marketing considerations of each individual manufacturer.

If this were not possible, as it probably would not be, the individual farm machinery manufacturer would have to face the alternatives of (1) total reorganization to accommodate the outside prescription of designs for Canadian farm machinery; in effect, this would mean the total isolation or perhaps virtual severance of Canadian operations upon the part of international manufacturers with concomitant escalation in administrative and production costs; or (2) the abdication of the Canadian market.

The latter possibility, of course, implies consequences in terms of manufacturing site locations and balance of trade --were imported machines, not conforming to Canadian government specifications, to be permitted entry. Under either set of circumstances there would be major disruption of MF's internationally rationalized engineering, manufacturing and marketing complex. Further, there would be a reduction in the competitive nature of the industry. Both these results would tend to lower efficiency and increase prices.

It was explained earlier that component standardization enables MF to take a transmission made in Sao Paulo, an engine manufactured in

France, sheet metal parts from England and assemble a tractor to specification in Detroit. The mix could be altered to include other factories in India, Italy and Mexico.

Similar integration is being established in combine manufacture among plants in five countries. Such programs cut production costs by permitting long production runs where they can be most economically performed. The implementation of suggestions that have been made for radical standaridzation within Canada would eliminate the benefits, both to the farmer and to the company, of such programs based on MF's internationally integrated engineering and manufacturing complex.

MF Standardization Program

Massey-Ferguson, both unilaterally and in cooperation with other farm machinery companies, is continually engaged in standardization programs. In North America, MF employes 10 engineers and technicians whose sole responsibility is to develop production and design standards. Hundreds of standards covering procedures, processes, materials, finishes and parts have been developed and are used daily throughout the company.

Industry Standardization Programs

At the industry level, organizations such as the Society of Automotive Engineers (SAE), the American Society of Agricultural Engineers, the Farm and Industrial Equipment Institute, the International Standards Organization and others to which farm machinery companies belong are

continually developing standards for industry-wide use.

Among the major contributions of the SAE, whose standards are the most widely accepted in the industry, are:

- the Nebraska test code for tractors;

- standardization of power-take-off and drawbar dimensions and relationships to permit safe coupling of implements to all makes of tractors;

- worldwide standardization of the three-point hitch to permit integration of all mounted implements with tractors;

- standardization of power-take-off pulley and belt speeds for power driven equipment;

- hydraulic coupling standardization for remote controlled implements;

- standardization of quick attaching couplers for three-point hitches:

- standardization of operator controls on farm tractors;

- standardized power-take-off drives, safety shielding and drive shaft splines;

- establishment of safety lighting and light standards;

- development of slow-moving vehicle sign for safety;

- establishment of drafting standards;

- development of hundreds of miscellaneous standards in fasteners, materials, fuels, lubricants, electrical systems, hydraulics, threads, splines and V-belts.

Looking to the future, standardization is likely to play an increasingly important part in expense control throughout industry as labor and material costs continue to rise. In the United States, the U.S.A. Standards Institute, in consultation with industry and consumer groups, has initiated a large program to set national standards covering several manufacturing industries. This type of coordinated approach could well be the pattern for future developments in standardization. Certainly any large scale project such as conversion to the metric system in North America would have to be undertaken jointly by representatives of all interests likely to be affected.

PATENTS

The company's engineering research efforts over the years have produced a wealth of patentable products and innovations. Patents, and the manufacturing rights they represent, are an attractive incentive to a business to take the risks involved in research and development.

Massey-Ferguson Patents

It is estimated that Massey-Ferguson Limited or its subsidiaries now have 2,000 active patents in about 45 countries. In addition, at present, MF has about 1,700 patent applications pending. Neither of these figures indicate a total number of different inventions since many MF inventions are patented separately in each country where such coverage is deemed prudent. As a rule, most MF inventions are patented in Argentina, Australia, Brazil, Canada, France, Germany, Italy, South Africa, the United Kingdom and the United States.

In addition to the patents resulting from its own research, MF manufactures some products under license from other companies.

For example, a license for North America from E.E. Burford under U.S. patent 3,202,087 covers an invention dealing with a mechanism for tying hay bales with wire. The company pays a small royalty on each unit.

Under U.S. 2,932,143 MF has a worldwide patent license from International Harvester Company to manufacture hay conditioners. MF pays a unit royalty.

Under Canadian 703,806 MF has a license from Paul Jacobs of Sylvania, Saskatchewan, to manufacture spring trip chisel plows on a royalty basis. This is a recent license and development of the commercial design is still in process. However, the inventor is receiving a minimum annual royalty in the meantime.

Under Canadian and U.S. applications only recently filed, the company has a license from W. Sowa and R. Batiuk of Kuroki, Saskatchewan, dealing with an improved swather arrangement. The machine is currently under development and the inventors, likewise, are receiving a minimum annual royalty.

Under Canadian patents 537,898 and 537,899, the company manufactures dyna-balance mowers, and pays a reasonable royalty to the Utah Scientific Research Foundation, a state-supported institution. The license is important primarily in the U.S. and Canada.

MF has never been unable to produce a machine because of refusal of a patent holder to license a patent.

Conversely, MF licenses a number of patent rights to other companies.

For example, Allis-Chalmers and Hesston have licenses for the U.S. concerning the retractable feed fingers used in combine tables. Worldwide licenses have been granted to International Harvester, Deere, Ford, Allis-Chalmers, Fiat and several other companies relating to the position and draft control mechanism used in tractors. New Holland and New Idea have a license dealing with MF's side delivery rakes.

Catalyst without Guarantee

Not all patents, nor the research and engineering efforts behind them, represent commercially successful investments. Stated differently, the value of the patent is equal only to the value of what it protects. But a patent, of course, is no guarantee that the time and money invested will pay off for the company. For example, to remain in the technological forefront, MF purchased a Lundell patent (Canadian 730,439) dealing with hay wafering. This invention was ultimately found to be commercially impractical. Likewise, earlier MF engineering efforts, embodied in Canadian patent number 708,762, failed to produce a satisfactory hay wafering machine.

Another example of the risks inherent in product development is the MF54 flail forage harvester project. When the flail chopper machine appeared on the market it represented a new concept in cutting, chopping, and field loading forage crops. The machine was relatively simple and economical. Using this principle, MF initiated the flail

forage harvester project in 1959 by combining a flail chopper with a secondary chopper and wagon loading mechanism. The basic flail chopper had performance and economic advantages for cutting and chopping forage crops used for direct feeding operations; however, the lengths of cut and non-uniformity of cutting was not entirely satisfactory for the mechanized unloading used in stored silage type of feeding.

The company's engineers believed that the combination of the direct flail cutting and the secondary chopping and loading would replace a considerable number of the conventional forage harvesters. The flail-type machine had certain operating advantages in rocky fields and appeared to be more economical to manufacture and market at a lower price than the conventional harvester.

The company continued its development program to design a harvester which would uniformly control the length of cut to meet criteria established by subsequent material handling methods and feeding practices. MF's development, testing,and analysis of forage handling and feeding problems continued with the expectation of perfecting a machine which would satisfy the demand of the forage harvester market.

During the extended period of development of the flail forage

harvester, the flail cutting principle for silage lost some favor among farmers and feeders and the emphasis shifted back to conventional type of forage harvesters, due primarily to the poor quality of flail cutting and little improvement in the handling and in the storing qualities of the flail-cut crop. By the time MF had reached the production stage of its machine it was evident the market had changed in a way that made it uneconomic to proceed with plans for full production. As a result, the project was cancelled.

Over a period of six years, the engineering expense totalled $360,300.

Importance of Patents

The Commission has asked, "What importance do patents play?" It is impossible to give a quantified answer to this question. Patents are, of course, important in the sense that they tend to "protect" the funds invested in the research and development necessary for product improvement and innovation. This protection, however, is provided only after the fact. The exceptionally ingenious and practically useful invention can, of course, provide revenue to a company through licensing fees.

On the other hand, patents to not lie so close to the heart of the farm machinery business as they do in some other industries. For example, MF estimates that it has 2,000 active patents. This figure may be compared to approximately 10,000 active patents

assigned to one of the leading North American petroleum companies. However, gross numbers can provide only a gross indication because patent rights to the Ferguson System or Pressure Control are certainly more valuable than any number of patents which produce no customer benefits or which govern inventions too expensive to manufacture and market.

Perhaps the best answer that can be offered to the question of patent importance is that in MF's opinion they are not of central and over-riding importance. This seems to be a characteristic of the industry for several reasons.

One is that research and design in the areas of internal combustion engines, hydraulics and, generally, in the field of mobile mechanical ground vehicles has been relatively intense for many years compared to the newer and more exotic fields of chemicals and electronics. The agricultural machinery field has been already "mined" by many inventors and engineers.

A second reason is that inventors and engineers of agricultural machinery demonstrate a pronounced ability to "design around" patents held by others. MF believes this has a stimulating effect on the industry and hastens the availability of farm machinery innovations to the farmer. Finally, licensing of patents is a common practice among farm machinery manufacturers. As stated

earlier, MF has never been unable to produce a machine because of refusal of a patent holder to license a patent. This availability of licenses produces essentially the same beneficial effects as just indicated for the ability to "design around" others' patents. It also frees research and engineering resources for concentration on other areas of possible innovation.

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In summary, the engineering department of the farm machinery group - North America helps serve the research and engineering needs of the company worldwide. The parent company maintains centralized control of all engineering departments worldwide, a circumstance which in simplest terms might be called a natural consequence of the international rationalization of MF's manufacturing facilities.

This arrangement yields benefits both to the company and to the customer. The company benefits through avoiding duplication and through the ability to concentrate financial and manpower resources on projects it considers of highest priority. The customer benefits through the minimization of engineering expense from elimination of duplication of effort.

The customer also benefits through the coordinated composite of expertise available to research and design new machinery and improve

current machinery. More specifically, these resources enable the company to offer the farmer competitive machinery which fulfill his needs for increasingly specialized equipment.

The customer also benefits from the manufacturing economies and enhanced parts availability that stem from component commonality and interchangeability which in turn stem from the integration of the engineering-manufacturing-marketing continuum. This continuum is also largely responsible for improvements in safety characteristics of MF machinery.

Increased machine efficiency is probably the prime criterion by which the company's machinery must be measured. As reflected in increased farm productivity, there is little doubt that this efficiency has increased. But in any ultimate sense, MF believes that a consideration of the overall user benefits must include a recognition of the relative intangibles of ease, comfort and speed of operation. These, of course, are humanly desirable qualities. MF believes that MF-engineered machinery offers such characteristics.

More important, MF believes, is the fact these man-machine characteristics have helped increase the farmer's measurable productivity while eliminating much of the sheer toil from his existence. This is the composite total of the MF engineering achievement and a reflection of the creative pressures of capitalistic economics and of the international environment in which MF does business.

Chapter X

WHOLESALE AND RETAIL FINANCING

Both the dealer and his farmer customers historically have required financing assistance. In the case of farmers, the need has been and continues to be for assistance in financing the purchase of both new and used equipment, partly because of the seasonality of farm income.

Dealers require help not only with machinery and parts acquisition but also with capital expenditures for starting their dealerships and with the working capital to continue operating them.

WHY MF ENTERED FINANCING

Over the years MF has evolved a number of plans expressly tailored to the various financial needs of both farmers and dealers. MF intends to continue this service. More plans are presently under study, and these will be introduced if and when the company is reasonably convinced that these plans will satisfy the needs they are intended to fill.

Later in this chapter the circumstances which led to the initial formulation of a number of different dealer and farmer financing plans will be described. The chapter will also explain the plans currently available and offer some examples of how they work.

Questions have arisen during the course of this Royal Commission inquiry concerning the motivation of farm machinery manufacturers in entering the finance business. Aside from normal desire to increase company profitability, there are several aspects to the answer.

Dealer and Farmer Needs

Perhaps the simplest part of the answer, as far as MF is concerned, is that the company undertook such financing only when it had come to believe that an unsatisfied need existed among its dealers and their customers for financing of the kind MF could provide.

These unsatisfied needs perhaps stemmed --and continue to stem from the nature of rural society and economy, e.g., the lack of concentrated fiscal resources in farming areas. Without having any strong views about individual deficiencies in the then existing sources of credit, the company was convinced that in total they were not entirely adequate. Prior to the introduction of MF's initial financing plans, the company's field marketing force in the normal conduct of day-to-day business received many informal expressions of dealer and farmer opinion that the traditional forms of financial assistance available were inadequate in certain respects. Thus, MF entered the field of specialized dealer and farmer financing in order to fill what the company, its dealers and their customers regarded as credit gaps. Massey-Ferguson fully expected its provision of financing would facilitate the dealer's purchase of MF equipment and its subsequent retail sale to his customers.

It should be noted that the farm machinery industry in North America is perhaps the only capital consumer goods industry which, for a combination of economic factors, finds it necessary to bear the cost of carrying its dealers' wholegoods inventories on such liberal terms --if it bears them at all. This MF does at substantial expense to itself.

The Problems of Seasonality

But there was a second, if slightly less compelling, reason why MF entered the field: to attempt to overcome the seasonality of agricultural machinery purchases. The farmer's machinery purchases previously had tended in the main to conform to his seasonal receipt of income. This purchasing pattern caused congestion and inefficiencies in MF's manufacturing and marketing departments. Therefore, a number of the plans were designed to help level out the peaks and valleys of demand of manufacture and of supply.

Portfolio Growth

The growth of the MF portfolio of wholesale and retail credit paper from 1960 through 1966 suggests that a need for its financing services has indeed existed. This growth is reflected in the following figures of MF funds backing dealers' inventories and farmers' MF machinery purchases:

Average Receivables Outstanding: 1960 and 1966

	Canada		U.S.	
	(millions of dollars)			
	1960	1966	1960	1966
Dealer receivables *	26.7	57.2	91.0	124.7
Retail receivables *	10.7	49.1	24.7	99.0
TOTALS	37.4	106.3	115.7	223.7

* These figures include financing on industrial and construction machinery. With respect to Canada, it is estimated that 92 percent of dealer receivables and 93 percent of retail receivables, as of October 31, 1966, represent farm machinery.

These figures show that in Canada, over the six-year span, dealer financing more than doubled and retail financing grew almost 400 percent, compared to about 300 percent in the U.S. Also, increased sales and prices certainly contributed to this growth in receivables.

STRUCTURE OF MF'S FINANCING OPERATIONS

The basis of MF's North American retail financing for farmers was established in 1960 with the incorporation of Massey-Ferguson Finance Company of Canada Limited in Toronto, and the incorporation of Massey-Ferguson Finance Corporation of Springfield, Illinois. (Massey-Ferguson Finance Corporation has now been renamed the Massey-Ferguson

Credit Corporation.)

The former is now a subsidiary of Massey-Ferguson Industries Limited and the latter is a subsidiary of Massey-Ferguson Inc. Dealers' purchases of goods at wholesale are financed by the respective manufacturing and marketing subsidiaries in Canada and the U.S.

The two financing companies are administered by a specialized group of credit experts known as the North American Finance Operation (NAFO). Headquarters for Canadian operations are in Toronto; headquarters for the U.S. operations are in Des Moines, Iowa. In addition, full-time credit personnel are located at all MF branches, i.e., in Canada at Montreal, Toronto, Winnipeg, Saskatoon and Calgary. These men and their counterparts elsewhere provide credit administration services to dealers and farmers in the area their branch is located.

FINANCING THE DEALER

As the Commission will recall, many MF dealers in the late '40s were former company agents. These men, prior to 1944, had acted, in essence, as order takers for the company. The story of the transformation of some of these agents into dealers, with the accompanying fuller responsibilities of independent businessmen, is told in chapter V.

The Need

After the war, these new dealers enjoyed a sellers' market until approximately 1950. By that time farmers' cash reserves from the war and post-war years were probably depleted. The need for farm machinery continued to be great but it was a need that often went unsatisfied for lack of sufficient credit facilities. The situation was eased somewhat with the introduction of MF financial plans for assistance to the farmer. (These early plans will be described later in this chapter.) With them farmers again had the means for acquiring machinery. But this did not entirely solve the problems of the dealers. As post-war scarcity of machines disappeared, dealers were forced to operate in a buyers' market. Many dealers reacted slowly and uncertainly to this change and were soon headed for difficulty. They found that they had to maintain an inventory of machines for immediate delivery if they were going to meet competition. Moreover, good dealers found themselves competing against some relatively unsophisticated dealers who often sold at unsustainably low profit margins and who accepted used machines as trade-ins at unrealistic high valuations.

Consequently, dealers' working capital eroded. For some, the end was bankruptcy. Others left the farm machinery business. Of those who remained many tried to protect themselves through stocking subminimum inventories of new machines and repair parts.

This trend was clearly against the interest of customers who depended

on ready availability of machines and parts. It was also disturbing to the company, for MF depended on local dealers to retail its machines and to service farmers who owned MF machines.

MF's Response

After examining the entire problem, MF acted to improve the situation. The first step was to offer the dealer finance plans that would enable him to maintain a comprehensive inventory of repair parts and new machines. The second step was to provide a program of instruction which would help the dealer to manage his business in a more profitable manner. (See chapter V.)

When they were still agents, MF dealers had received parts and machines on consignment, i.e., the parts and machines in the hands of agents were MF property. When they became dealers, however, the former agents had to pay the company for goods received on a conditional sales basis. In the buyers' market which had developed, many dealers did not have the money to do this.

Wholesale Financing Plans

The company attacked the financing problem in two ways: (1) it provided the dealer with credit to finance parts inventories, and (2) it provided credit for financing machine inventories. It should be borne in mind that assistance with parts financing is relatively informal, and basically takes the form of deferred terms.

Financial assistance with wholegoods is more formal and is implemented through floor planning by way of lien notes and mortgages. Wholegoods financing for the dealer requires much more MF money than parts financing. Also, the critical importance of maintaining adequate parts inventories demands that the associated paperwork (and the delays they might otherwise cause) be kept to a strict minimum.

Assistance with Parts Inventories

Company practice had been to sell parts to dealers on a 30-day open account. Balances owing were to be paid 10 days after the company closed its books each month. But some dealers financed their day-to-day operations with proceeds from parts and other sales and so were unable to replace parts and other merchandise sold. Thus dealer parts inventories tended to become depleted. This depletion caused what the company considered to be unnecessary delays in furnishing repair parts to farmers. It also reduced sales and, in general, lowered the effectiveness of MF's dealers.

Master stock order plan: to rectify these conditions, the company evolved its master parts stock order plan, still being refined today. Under it, the dealer and the company's district manager jointly review, normally in the winter, the condition of the dealer's inventory of fast-moving parts well in advance of the season of use. Specifics of the plan vary from year to year. In general, however, the plan features discounts, extended terms of payment and prepaid freight by

the company. The master parts stock order plan is MF's basic means of achieving its objective of encouraging the dealer to maintain a comprehensive parts inventory to serve his customers.

Fall stock order plan: while the master stock order program did much to increase parts availability to farmers, by itself it was not enough. Consequently, the company initiated the fall stock order plan --a program specifically intended to increase parts availability during the crucial harvesting season. It works this way: the MF district manager and the dealer review the dealer's harvesting machine parts inventory long before harvest. Based on this review, a major and comprehensive order is written for harvesting machine parts. The dealer receives them, freight prepaid, before the harvest begins in his area. Payment is not due the company for at least three months. By that time he has sold and collected for most of the parts. The dealer is carried interest free for the three-month period under this particular plan. This, in turn, improves his ability to provide his customers the replacement parts they require.

Monthly stock order plan: to supplement the master and fall ordering programs, the company formerly offered a monthly parts stock replenishment program. Its prime purpose was to encourage dealers to order regularly so as to have parts on hand in reasonable supply to meet their customers' needs. Such ordering practices, as indicated earlier, reduce the frequency of emergency orders which are costly in

terms of extra telephone/telegraph expenses and premium freight rates.

Enthusiastic dealer response led to this program being put on a twice monthly and later on an every-other-week basis. Payments for these orders are due on the 10th day of the calendar month following the month in which the invoice is dated. The company pays all freight on these orders as it does on master stock orders and fall stock orders. The dealer, his customers and the company all benefit from the maintenance of adequate parts inventory at all times through the habitual and regular placement of the bi-weekly order.

New dealer initial stock order: another specialized parts plan is the new dealer initial stock order. This plan assists the new dealer in the selection of an adequate starting parts inventory. The specifics of this plan, too, vary. Essentially, however, it offers prepaid freight and deferred payment terms at six percent, for up to five years, for principal amounts up to $15,000 with a moratorium period of up to two years.

Parts for new products: extended payment terms and prepaid freight are available to dealers on purchases of parts for newly introduced products. The dealer enjoys a 30-month, no penalty, return privilege on those parts. (See chapter V on marketing and chapter VIII on parts for further tangential aspects of this and other dealer assistance programs.) To guide the dealer in placing orders, he is supplied with

a complete listing of new machine part numbers and suggested levels of parts inventory. From time to time, MF announces deferred terms on special new parts, generally falling into the accessory or hardware category, so as to offer farmers the convenience of one-stop shopping.

* * *

The parts financing plans described above, in the main, share two characteristics. One is the obvious financial assistance involved. The other is less obvious. It is an arrangement of terms which encourages the dealer to take advantage of interest arrangements offered in connection with the plans.

The company, however, through its district managers and other company personnel, endeavors to provide the dealer with the know-how necessary to cope with all parts problems. Indicative of MF's concern is a 40-page section in MF's dealership management manual. This material explains the disadvantages of an unbalanced inventory, and it offers guidance on parts purchase control, on inventory turn-over calculation, on record posting, on receiving procedures and disposition of surplus parts as well as on many related subjects.

Assistance with Machine Inventories

With the end of the sellers' market in 1950, some dealers encountered the same difficulties in financing their machine inventories as they

did in financing their parts inventories. Indeed, the financial requirements of maintaining an adequate wholegoods inventory far exceed those for an adequate parts inventory. The desirability of the dealer having a reasonable selection of machinery on hand is not so evident as it is for parts inventory. Nonetheless, immediate availability is an obvious advantage, particularly since it enables potential customers to inspect machines and witness demonstrations with them. Conversely, the absence of a machine inventory places the dealer at a considerable competitive disadvantage --both with regard to delivery and the farmer's natural desire to operate the actual machine rather than just see a picture of it.

"Floor planning": to fulfill this machine inventory need, the company introduced a simple 12-to-23-month machinery purchase plan for dealers. Today, this assistance, which has been much improved over the years, is known as "floor planning". It applies to both new and used equipment.

However, there should be no mistake about MF's basic attitude toward floor planning. Floor planning, for all the benefits it provides the dealer, which are explained below and which enable the dealer to serve his customers better, represents considerable expense to the company. The company has continuously investigated various possibilities for reducing or eliminating floor planning expense. Floor planning appears, under present economic circumstances in the agricultural community, to

be a necessary evil for manufacturers.

New machinery floor plans: in the case of new MF machines, the plan is available for machines having a total invoice price of more than $100. The dealer is obligated under an interest-free, one-year lien note for each machine he purchases. In the case of tractors, the note matures 12 months from the first calendar month following the month of shipment. On other machines the note is due 12 months from the first of the calendar month following the end of the established "season of use".

Schedules of seasons of use in North America follow this page. These seasons of use, of course, are based on prevailing regional agricultural and weather conditions as they relate to the farmer's use of his different machines. In the event the machine is encumbered or sold prior to the expiration of the 12-month time spans indicated above, the note matures immediately. A sample dealer note is also shown with the season schedules as is the chattel mortgage required on used equipment floor plans in Canada.

Used machinery floor plans: these are available on used machinery traded to dealers on the retail sale by dealers of new MF equipment or used equipment floor planned by MF. The "used" plan has slightly different terms than the new equipment floor plan. The duration of the used equipment floor plan term is intended to encourage the

Appendix To Massey-Ferguson

DEALER'S DISCOUNTS AND TERMS

SEASONS OF USE

As applicable to: CANADA

The following are the normal seasons of use as established by the Company to determine maturity of payments under the Company whole goods, attachments and accessories floor plan terms, referred to in the Massey-Ferguson Dealer's Discounts and Terms Schedule, effective November 1, 1965:

TYPE OF EQUIPMENT	NORMAL SEASON OF USE
TILLAGE PLANTING AND CULTIVATING — Cultivators — Planters — Drills — Harrows — Fertilizer Sowers — Plows	April 1st to September 30th
HAY AND FORAGE HARVESTING — Balers — Mowers — Rakes — Forage Harvesters	June 1st to September 30th
GRAIN HARVESTING — Combines — Swathers	July 1st to September 30th
CORN HARVESTING — Corn Pickers	September 1st to January 31st
ALL OTHER AGRICULTURAL MACHINES — Dozer Blades — Wagons — Farm Loaders — Manure Spreaders	All Year (continuous monthly)

X

Appendix to Massey-Ferguson
AGRICULTURAL MACHINERY
DEALER'S DISCOUNTS AND TERMS

SEASONS OF USE

As applicable to: U.S. BRANCHES OF—Denver, Kansas City, Portland, Stockton.

The following are the normal seasons of use as established by the Company to determine maturity of payments under the Company machines, attachments and accessories floor plan terms, referred to in the Massey-Ferguson Dealer's Discounts and Terms Schedule, effective January 1, 1967:

TYPE OF EQUIPMENT	NORMAL SEASON OF USE
TILLAGE PLANTING AND CULTIVATING — Cultivators — Planters — Drills — Harrows — Fertilizer Sowers — Plows	March 1st to November 30th
HAY AND FORAGE HARVESTING — Balers — Mowers — Rakes — Forage Harvesters	May 1st to August 31st
GRAIN HARVESTING — Combines — Swathers	June 1st to September 30th
OTHER HARVESTING — Corn Combines — Corn Pickers — Corn Heads — Rice Combines — Bean Combines	September 1st to November 30th
UTILITY TOOLS AND MISCELLANEOUS AGRICULTURAL MACHINES — Farm Loaders — Manure Spreaders	December 1st to March 31st
ALL OTHER AGRICULTURAL MACHINES	All Year (continuous monthly)

Appendix to Massey-Ferguson
AGRICULTURAL MACHINERY
DEALER'S DISCOUNTS AND TERMS

SEASONS OF USE

As applicable to: U.S. BRANCHES OF—Dallas, Memphis, Atlanta, Nashville.

The following are the normal seasons of use as established by the Company to determine maturity of payments under the Company machines, attachments and accessories floor plan terms, referred to in the Massey-Ferguson Dealer's Discounts and Terms Schedule, effective January 1, 1967:

TYPE OF EQUIPMENT	NORMAL SEASON OF USE
TILLAGE PLANTING AND CULTIVATING — Cultivators — Fertilizer Sowers — Planters — Plows — Drills — Harrows	March 1st to November 30th
HAY AND FORAGE HARVESTING — Balers — Mowers — Rakes — Forage Harvesters	May 1st to September 30th
GRAIN HARVESTING — Combines — Swathers	June 1st to November 30th
OTHER HARVESTING — Corn Combines — Corn Pickers — Corn Heads — Rice Combines — Bean Combines	September 1st to November 30th
UTILITY TOOLS AND MISCELLANEOUS AGRICULTURAL MACHINES — Farm Loaders — Manure Spreaders	December 1st to March 31st
ALL OTHER AGRICULTURAL MACHINES	All Year (continuous monthly)

X

Appendix to Massey-Ferguson
AGRICULTURAL MACHINERY
DEALER'S DISCOUNTS AND TERMS

SEASONS OF USE

As applicable to: U.S. BRANCHES OF—
Baltimore, Columbus, Lansing, Springfield, Syracuse, Des Moines, Racine, and Minneapolis.

The following are the normal seasons of use as established by the Company to determine maturity of payments under the Company machines, attachments and accessories floor plan terms, referred to in the Massey-Ferguson Dealer's Discounts and Terms Schedule, effective January 1, 1967:

TYPE OF EQUIPMENT	NORMAL SEASON OF USE
TILLAGE PLANTING AND CULTIVATING — Cultivators — Planters — Drills — Harrows — Fertilizer Sowers — Plows	March 1st to October 31st
HAY AND FORAGE HARVESTING — Balers — Mowers — Rakes — Forage Harvesters	May 1st to August 31st
GRAIN HARVESTING — Combines — Swathers	June 1st to September 30th
OTHER HARVESTING — Corn Combines — Corn Pickers — Corn Heads — Rice Combines — Bean Combines	September 1st to November 30th
UTILITY TOOLS AND MISCELLANEOUS AGRICULTURAL MACHINES — Farm Loaders — Manure Spreaders	December 1st to March 31st
ALL OTHER AGRICULTURAL MACHINES	All Year (continuous monthly)

Massey-Ferguson Industries Limited

REFERENCE X

DEALER WHOLESALE NOTE AND INVOICE

BRANCH CODE AND NAME	INVOICE DATE MO. DAY YR.	SALES DIST.	DEALER CODE	INVOICE AND NOTE NO

SOLD TO

SHIP TO (IF DIFFERENT FROM "SOLD TO")

REFERENCE NO	CAR NO.	DATE SHIPPED MO DAY YR	SHIPPED FROM CODE NAME	SHIPPED VIA

QUANTITY SHIPPED	MACHINE CODE SERIES	TYPE	S	DESCRIPTION	DEALER PRICE EACH	VALUE

SUGGESTED TOTAL LIST EXCLUDING CHARGES

TOTAL GOODS

MISCELLANEOUS	DUTY	SALES TAX	SURCHARGE	FREIGHT & HANDLING	FREIGHT FINANCE	TOTAL SUNDRY (NON VOLUME)

TAX LICENSE NO	TERMS	MATURITY DATE MO. DAY YR.	SERIAL NO.	SUGGESTED TOTAL LIST INCLUDING ALL CHARGES	TOTAL PAYABLE

SEE REVERSE FOR DEALER WHOLESALE NOTE

MF 135 4 67

DEALERSHIP	DEALER CODE	BRANCH	INVOICE NO.	INVOICE TOTAL

MACHINE DESCRIPTION	MACHINE CODE	SERIAL NO	DATE SHIPPED TO DEALER MONTH DAY YEAR	RETAIL DELIVERY DATE MONTH DAY YEAR

Massey-Ferguson Industries Limited

MF 135A 4 67

QTY	MACHINE CODE	QTY	MACHINE CODE	QTY	MACHINE CODE	QTY	MACHINE CODE	QTY	MACHINE CODE

DEALER INVENTORY CONTROL

OFFICE COPY

WHOLESALE NOTE

19

On or before the maturity date indicated on the reverse and for value received, the undersigned promises to pay to Massey-Ferguson Industries Limited or order, the amount of this note recited on reverse with interest in accordance with the current published Dealer schedule of Discounts and Terms.

X

Dealer shall have the right to sell the equipment described on the reverse in ordinary course of business. At the time of such sale this note, or the part representing the equipment sold, is to become due and payable thereupon.

Title to the equipment described on the reverse is to remain in the holder of this note until the full purchase price has been paid to holder therefor or until a bona fide sale thereof in ordinary course of business in which latter event dealer shall hold all proceeds of such sale to the order of the holder of this note until this note has been paid in full. Holder shall have full rights of repossession of the equipment upon dealer's default, to the extent allowed by law. Dealer does hereby consent to any entry by the holder of this note or agent thereof necessary to the exercise of such rights of repossession.

Holder may assign this note, and the assignee shall succeed to all of the holder's rights and the assignment or any extension made hereof, or loss, injury or destruction of such equipment shall not release the dealer from any obligations hereunder.

Dealer, endorser and guarantor hereby waive notice of non-payment, protest, presentment and demand and if this note is not paid at maturity dealer agrees to pay all expenses incurred in collecting the same by suit or otherwise and all exemptions are hereby expressly waived.

Dealer further agrees to execute such further security instruments and documents attributable to such equipment as the holder of this note shall request.

Dealer Firm Name

Witness By__________________ Authorized Signature Title

MF-1351 (Rev. 11/64) (For use in all Canadian Provinces except Quebec)

"A"

CHATTEL MORTGAGE

20

Know all Men by these Presents, that ....

of ...., Province of ....,

mortgagor, is indebted to MASSEY-FERGUSON INDUSTRIES LIMITED of .... (Branch Location), Province of ....,

mortgagee, its successors and assigns in the sum of ....

dollars and cents ($ ....) which said indebtedness or an instalment thereof is past due and unpaid. In consideration of the said mortgagee extending the time for payment of the said indebtedness to the .... day of .... 19 ...... and for other good and valuable consideration hereby acknowledged, the said mortgagor, to collaterally secure the said indebtedness payable in amounts as stated in the schedule of instalments shown below and made a part hereof with interest at .... % per annum to maturity and .... % after maturity does hereby grant, bargain, sell, mortgage and convey to the said mortgagee its successors and assigns the following described personal property, goods and chattels together with all accessories, equipment, attached thereto, the whole of which is referred to herein as "the said chattel", as follows:

Quan	Complete Description of Chattels	Serial No.

with and including all repairs, replacements and renewal of, accessions and additions to and substitutions for the said chattel, none of which shall be attached to any real estate so as to become a part thereof and the increase thereof, now in the possession and control of the mortgagor and is situate, lying and being upon or about the following lands and premises ....

in the .... of .... in the Province of ....

The mortgagor warrants to the mortgagee that the said chattel is his property free and clear of all liens, mortgages, contracts, debts, charges and encumbrances. All increase of any of the live stock, if any, described above whether born or unborn on the date hereof and as well after as before the time when such increase, follows the mother for nurture are included in these presents so long as the said indebtedness remains unpaid. (Where the said chattel hereby mortgaged is stock in merchandise, it is intended and agreed hereto that the mortgagor shall account to the mortgagee for all sales thereof on a monthly basis and that the proceeds of sale of merchandise covered hereby shall be applied to the mortgage debt.)*

To Have and to Hold All and Singular, the said chattel aforesaid, to the mortgagee forever, shall pay or cause to be paid to the said mortgagee, his successors and assigns, according to its conditions, the original debt incurred by said mortgagor and payable to said mortgagee, described above or in the instrument securing the original debt, then these presents to be void and of no effect. But if default shall be made in the payment of said sum of money or any instalment thereof or the interest thereon, or if any attempt shall be made to remove or dispose of, or injure, said chattel, or any part thereof, by said mortgagor, or any other person, or if mortgagor does not take proper care of said property, or shall leave and abandon same or shall move same from registration district where the property is now located without written consent of mortgagee or should the mortgagee at any time deem itself insecure or should the mortgagor be declared bankrupt or make an authorized assignment or permit the said chattel to be seized or taken in execution, or should any action or suit be taken or instituted in any court against the mortgagor, all of the unpaid instalments on the original instrument and this mortgage shall become immediately due and payable thereupon and thereafter, it shall be lawful, and the mortgagor hereby authorizes said mortgagee, his successors or assigns, or his authorized agent to enter upon the premises wherever said property may then be found and take possession of the said property, and hold or sell or dispose of the same and all equity of redemption, at public auction or private sale, at option of mortgagee with or without notice, such notice being hereby expressly waived, and on such terms as mortgagee or his agents may see fit, and said mortgagee may become the purchaser of said property at said sale, retaining such amounts as shall pay the aforesaid sum and interest thereon, and such other expenses as may have been incurred, returning the surplus money, if any, to the mortgagor or his assigns upon demand, and if said proceeds of such sale are not sufficient to pay the debt hereby secured, then mortgagor agrees to pay any deficiency remaining. And so long as the conditions of this Mortgage are fulfilled, the mortgagor is to remain in peaceful possession of said property, and in consideration thereof agrees to keep said property in as good condition as it now is at the mortgagor's cost and expense, to pay taxes or assessments that may be levied against the goods and chattels mortgaged, or on the mortgage or the debt secured thereby, and to keep the goods and chattels insured in favor of the mortgagee in the amounts and kinds of insurance as directed by the mortgagee. Any provisions hereof invalid in any Province shall be inoperative as to such Province, but without invalidating the remaining provisions hereof.

In Witness Whereof, The said mortgagor has hereunto set his hand and seal this .... day of ...., A.D. 19 ......

SIGNED, SEALED and DELIVERED in Presence of

.... (Signature of Witness) .... (SEAL) (Signature of Mortgagor)

.... (Signature of Witness) .... (SEAL) (Signature of Mortgagor)

Execute in triplicate. All signatures must be in ink and witnessed. Type or print Name(s) of mortgagor(s) beneath signature(s).

*Delete where applicable and Mortgagor must then initial deletion in margin.

SCHEDULE OF INSTALMENTS

	Due Date	Amount		Due Date	Amount
1.			13.		
2.			14.		
3.			15.		
4.			16.		
5.			17.		
6.			18.		
7.			19.		
8.			20.		
9.			21.		
10.			22.		
11.			23.		
12.			24.		

CHATTEL MORTGAGE

....

to

MASSEY-FERGUSON INDUSTRIES LIMITED

Filed this .... day of ....

A.D. 19 .... at .... o'clock

.... M/as No. ....

.... (Signature of Official)

Clerk .... Court of ....

AFFIDAVIT OF EXECUTION

(For use in all provinces where the Mortgagor is an individual)

PROVINCE OF ....
County of ....
TO WIT:

I, ... of
(Name of Witness in full)
the .... of ....
In the Province of ....
MAKE OATH AND SAY:

THAT I was personally present and did see the within bill of sale by way of mortgage duly signed, sealed, executed and delivered by ...., (Name of Mortgagor)
the Mortgagor therein named, and I am the attesting witness to the execution thereof, by the said Mortgagor and do reside at .... and am .... (Occupation) and that the name .... set and subscribed as a witness to the execution is in my handwriting, and that the said bill of sale by way of mortgage was executed by the said Mortgagor at .... in the said Province on the .... day of .... A.D. 19 ....

THAT the said Mortgagor at the time of giving the said bill of sale by way of mortgage resided and still resides at .... and was and still is .... (Occupation)

SWORN before me at ...., in the
Province of ...., this .... day of
.... A.D. 19 ....
....
A Commissioner for Oaths, N.P. J.P. etc., in and for the Province of
....

.... (Signature of Witness)

AFFIDAVIT OF BONA FIDES (ALL PROVINCES)

PROVINCE OF ....
County of ....
TO WIT:

I, ... of
(Name of Massey-Ferguson Industries Limited Agent)
the .... of ....
in the Province of ....
MAKE OATH AND SAY:

1. THAT I am the .... (Insert Br. Mgr., Admin. Serv. Mgr., Cr. Mgr. or Acct. Sup.) at .... Branch, the duly authorized agent of MASSEY-FERGUSON INDUSTRIES LIMITED at ...., the Grantee named in the within bill of sale by way of mortgage, therein and hereinafter called the Mortgagee, and I am aware of all the circumstances connected with the said bill of sale by way of mortgage and have a personal knowledge of the facts herein deposed to:

2. THAT the Grantor named in the within bill of sale by way of mortgage, therein and hereinafter called the Mortgagor, is justly and truly indebted to the Mortgagee in the sum of $ .... which is the sum mentioned in the said bill of sale by way of mortgage, and which is justly due or accruing due from the Mortgagor to the Mortgagee.

3. THAT the said bill of sale by way of Mortgage was executed in good faith and for good and valuable consideration and for the express purpose of securing to the Mortgagee the payment of money justly due or accruing due from the Mortgagor to the Mortgagee, and not for the mere purpose of protecting the goods and chattels mentioned therein against the creditors of the Mortgagor, or of preventing the creditors of such Mortgagor from obtaining payment of any claim against the Mortgagor or for the purpose of defrauding the creditors of the Mortgagor or any of them.

SWORN before me at ...., in the
Province of ...., this .... day of
.................................., A.D. 19 ....
....
A Commissioner for Oaths, N.P. J.P. etc., in and for the Province of
....

.... (Signature of Deponent)

AFFIDAVIT OF EXECUTION (ONTARIO ONLY)

If Mortgagor is a Corporation

PROVINCE OF ONTARIO
County of ....
TO WIT:

I, ... (Name of Witness)
of the .... of .... in
the .... of ....,
...., make oath and say:

1. I was personally present and did see the within mortgage duly sealed and executed by The .... Limited, one of the parties thereto, under the hands of .... (Name) and .... (Name).

2. I know the said .... and ...., and that they are the President .... and Secretary .... respectively of the said company, and that the signatures .... and .... to the said mortgage are of their proper handwriting.

3. By a by-law of the said company the (President) .... and (Secretary) .... are authorized to sign the said mortgage on behalf of the said company and to affix its corporate seal thereto.

4. The name .... (Name of Witness) set and subscribed as a witness to the said signatures, is of the proper handwriting of me, this deponent.

5. The said mortgage was executed on the .... of ...., in the .... of ...., on the .... day of .... 19 ....

SWORN before me at ...., in the
Province of Ontario, this .... day of
.................................., A.D. 19 ....
....
A Commissioner for Oaths, N.P. J.P. etc., in and for the Province of Ontario.
....

.... (Signature of Witness)

AFFIDAVIT OF WITNESS (B.C. & N.B. ONLY)

By Officer of Mortgagor Corporation

PROVINCE OF ....
County of ....
TO WIT:

I, ... of ....,
president (secretary, treasurer, director) of the .... (Name of Mortgagor Corporation)
make oath and say as follows:

1. That the paper writing on the reverse side hereof, and marked "A", is a true copy of a bill of sale by way of mortgage, and of every schedule or inventory thereto annexed or therein referred to as made, given, and executed by the said .... (Name of Mortgagor Corporation)

2. That I, as president (secretary, treasurer, director) of the said corporation, being duly authorized so to do, did affix the seal of the said corporation to the said bill of sale by way of mortgage, did sign the said bill of sale by way of mortgage, as president (secretary, treasurer, director) of the said corporation, and did duly deliver the said bill of sale by way of mortgage as the act and deed of the said corporation on the .... day of ...., 19 ....

3. That the head office or chief place of business of the said corporation in .... (B.C. or N.B.) is situate at .... (Address) in the said province.

SWORN before me at ...., in the
Province of ...., this .... day of
.................................., A.D. 19 ....
....
A Commissioner for Oaths, N.P. J.P. etc., in and for the Province of
....

.... (Signature of Officer)

dealer to recondition the machine and sell it promptly. Without this encouragement, active dealers might find their working capital tied up in used machines. To qualify for used equipment floor plan assistance, the equipment traded in must have a wholesale, "as is" value of at least $400. The value of the note is limited to 75 percent of the "as is" wholesale value or the balance due on the new wholesale note on which the used machine is traded. The machine is carried interest free for six months on the note signed by the dealer. Extensions, at interest, are available after six months.

Used tractors, as year-around items, can be extended for three months on payment of at least 10 percent of the balance owing or upon reconditioning of the tractor to the satisfaction of the company. During the extension period six percent interest is charged. Another three-month extension is available upon payment of another 10 percent of the balance. Interest continues at six percent per annum.

For other used agricultural machines the six-month interest-free floor plan also applies. However, since machines other than tractors are seasonal in application, their floor plan extensions are hinged to the first calendar day of the last month of the established regional season of use. To obtain an extension beyond the initial six months requires payment of 10 percent of the note or reconditioning of the machine to the satisfaction of the company. Interest during the extension is six percent per annum.

The used machinery floor plan, in addition to ordinary trade-ins on MF machinery, also applies to the machine the company occasionally has to repossess from retail customers who default under the terms of a retail contract with the company. It also applies to machines the company itself has used and to machines used by agricultural colleges and other institutions. (These latter are initially purchased or leased directly from the company and eventually returned to the company.) All these machines and their attachments and accessories are sold to the dealer on floor plan for resale as used equipment.

As mentioned above, floor plan assistance on used equipment is limited to 75 percent of the "as is" wholesale value. This provision discourages dealers from offering unrealistic valuations on trade-ins. Used machinery sales, in general, still present financial problems to Canadian dealers, the company's used floor plans notwithstanding. A 1966 balance sheet and operating statement study of about 80 successful MF dealers in Canada shows substantial losses in handling used machinery. The dealers with under $250,000 in total annual sales lost 10.9 percent on their used equipment sales. Dealers in the $250,000-to-$500,000 range showed a 19.5 percent loss on used equipment, cutting before-tax profits in half; and dealers with total sales volumes of over $500,000 lost 1.2 percent on their used sales.

Dealers' methods of determining a realistic appraisal figure on trade-ins, particularly in view of traditional over-allowances, are, in MF's

opinion, far from scientific. Methods employed are inconsistent among dealers. Essentially, each individual appraisal reflects that particular dealer's judgment based upon his experience. And each individual judgment is subject to the variations of immediate circumstances which may cause the difference between profit or loss to the dealer on the particular transaction.

U.S. dealers, however, generally show small gross operating profits on used equipment. The U.S. dealers in the $250,000 to $500,000 total-volume range show results from a 2.9 percent loss to a 3.8 percent profit depending on their geographical region.

Special Financial Assistance for Dealers

Additional financial help offered the dealer includes the dealership equipment plan. This enables the dealer to improve his customer service. The plan provides financing for purchase of shop equipment, service tools and display fixtures. The amount involved is usually $300 to $3,000. If the dealer repays in three equal monthly instalments, down payment and interest are waived entirely. If he needs more time, he pays 10 percent down. Maximum maturities depend on the amounts of the notes. For example, contracts for less than $600 must be paid in no more than six equal monthly payments; contracts for $3,000 or more must be paid in no more than 36 equal monthly payments. The effective financing rate is 13.566 percent per annum for a 12-month, equal-monthly-instalment contract. Finance charges, and their variation

under different contracts, are discussed later in this chapter.

In order for the company, the dealer and the customer to reap the full benefits of financial assistance requires the efficient execution of a number of related programs. Perhaps two of the most important are business training for dealers, treated in chapter V; and the company's distribution system, discussed in chapter VII. MF believes that its approach to minimizing total costs involved in the financing-distribution-merchandising continuum has been effective. The company, however, is continuing its efforts to improve the efficiency with which these functions are fulfilled.

FINANCING THE FARMER

Just as the dealers have required financial assistance, so have their customers. When the farmer's cash reserves were becoming depleted by about 1950 he had to look to others for assistance in financing the purchase of agricultural machinery. This often led him to the dealer. The dealer, in turn, presented the problem to the company with the simple logic that he could sell more machinery if his customers could secure financing.

The MF Finance Plan

The company responded with the Massey-Harris periodic time payment service. This service was offered to all MH dealers and was

welcomed by them. The plan has been improved and refined over the years. Its original concept called for varied minimum down payments depending on the repayment schedule selected by the farmer.

If he elected to repay in equal monthly instalments over one, two or three years, a 20 percent down payment was acceptable. If, however, the farmer wanted a repayment schedule related directly to the dates of his own expected income --and perhaps involving fewer but larger instalments --a minimum down payment of 30 or 35 percent was required. This maintained realistic equivalency between the depreciating value of the machine and the unpaid obligation of the purchaser. Other characteristics included: a maximum three-season term, i.e., 34-36 months; a minimum note of $300; and a minimum payment per instalment of $20.

In 1957 this became known as the Massey-Harris-Ferguson protected time payment service. The new name highlighted insurance features which had been added. One provided life insurance on the owner to the extent of the unpaid balance of his contract. Another provided damage coverage on his machine for amounts over $5 plus $25-deductible collision coverage. The finance charge on this plan was about 11.7 percent per annum.

New advantages were added between 1957 and 1960 to make the plan even more flexible. Perhaps the most notable feature was "payment skipping".

The skip payment feature enabled the farmer to schedule repayment through a combination of regular monthly payments and irregularly spaced larger "balloon" instalments. The total combination was scheduled to correspond with his expected income.

Other changes were also made in 1960. The maximum repayment period was extended from 34-36 months to 42 months. The down payment requirements were adjusted in view of the longer repayment span and the skip payment feature. The plan was extended to include used equipment costing $400 or more. Life insurance continued on all customers as before. The property insurance on the machine itself was changed to $50-deductible collision and $25-deductible theft and malicious mischief coverage.

By 1966, the plan's terms were lengthened to a maximum of 48 months. The minimum contract allowed on new equipment was reduced from $300 to $200 and the collision insurance was changed to $100-deductible. Down payments were increased as appropriate in view of the longer repayment span.

Finance Charges

The MF finance charge, which includes both credit life and property damage insurance protection, varies from 12.746 to 14.943 percent per annum depending on the plan selected by the customer. The exact rate depends on length of contract, payment pattern and amount financed.

It should be noted that the dealer receives 10 percent of the finance charge in consideration of his administrative services such as preparing, executing and filing the retail contracts.

Because of recent provincial "consumer credit" legislation in Alberta, British Columbia, New Brunswick, Nova Scotia, Ontario, Prince Edward Island and Saskatchewan, MF will be preparing revised payment pattern tables to comply with such legislation. These would show a standard actuarial percentage rate for finance charges consistent with tolerances allowed by the various provincial statutes.

Massey-Ferguson has already furnished the Royal Commission copies of the company's retail finance and rate charts. These materials contain instructional details MF provides its dealers on how to calculate transactions; they also indicate the flexibility of the company's plans in meeting customers' various financial requirements and circumstances. These same materials also provide a typical example of MF financing activity as the Royal Commission requested.

SPECIAL FINANCIAL ASSISTANCE FOR FARMERS

The company has also developed plans to accommodate customer machinery needs and financial circumstances.

Equity Financing

One of these is "equity financing". This plan substantially increases the farmer's ability to purchase equipment by allowing him to use his equity in his present machinery as part or all of the down payment on new equipment.

Special Product Financing

Another new plan covers retailing of special products. These special products include 15-20 light machines such as garden tractors, snow blowers, garden tillers and others. The plan adjusts for the smaller contracts usually involved, frequent absence of trade-ins and the pressure of available competitive financing. Minimum down payment is 10 percent and the normal term is 24 months. Minimum monthly payment is $10. Property damage insurance and life insurance on the life of the purchaser to the extent of the unpaid balance are carried in the contract.

Equipment Leasing Plan

Still another specialized plan is designed for customers who prefer to lease equipment rather than buy it. Under this plan, the dealer actually sells the machine back to the company at retail price. The company becomes the lessor and the farmer makes his payment to the company. (A sample lease follows.)

X

Massey-Ferguson Industries Limited

EQUIPMENT LEASE

No.________________

Reinstated ☐

THIS AGREEMENT made this__________day of__________19____between Massey-Ferguson Industries Limited, a Company incorporated under the laws of Canada with its principal place of business in Toronto, Ontario, and with a Branch Office located at________________________________

Province of______________________, Lessor, hereinafter called Company, and________________

____

(where applicable state name of individual, partners or corporation)

(a______________________corporation) doing business as________________________

______________________________________of______________________________

(trade name of individual or partnership) (Street)

____, Lessee, hereinafter called Holder.

(City) (Zone) (Province)

WITNESSETH that in consideration of the mutual covenants, hereinafter set forth the Company and Holder, hereby agree as follows:

1. The Company hereby leases to the Holder and the Holder hereby leases from the Company the machine, equipment and attachments (hereinafter referred to as equipment) described as follows:

Quantity	Description Including Make and Type	Model	Serial Number

2. The term of this lease shall be__________consecutive months commencing on the date of delivery of the equipment to the Lessee, for a total rental of________________________________
($________________) which said rental shall be paid by the Holder in advance of use period as follows:

(i) Monthly Rental Payments:

Twelve ☐; Twenty-four ☐; Thirty-six ☐: Forty-eight ☐; equal consecutive monthly payments of________________________________($________________)

OR,

(ii) Non-monthly Rental Payments:

__________equal Quarterly ☐; equal Semi-Annual ☐; equal Annual ☐; payments of__________
________________________________($________________).

The payments described above shall fall due on the nearest 1st or 15th day of the month which corresponds to the date of delivery as applicable to the above indicated method of payment.

(iii) The Holder shall pay on the execution of this agreement as advance rental, the sum of X

______________________________ ($______________) which sum shall be applied to the first rental payment due hereunder and any excess thereof to be applied to the last and second to last rental payment due hereunder.

(iv) All rental payments shall be paid at the Branch/Zone Office of the Company at

____

(Address) **(Zone)** **(Province)**

or such place as the Company hereafter may designate.

3. The equipment shall at all times be the sole property of the Company which shall have exclusive title thereto and the Holder shall have no right title or interest therein except his interest as Holder thereunder. It is expressly understood that this is a contract of leasing only and does not constitute a contract of sale or agency, express or implied, between the Company and Holder.

4. The Holder covenants and agrees:

(i) That he, his servants, agents and employees shall comply with all Federal, Prov. and Municipal laws and applicable insurance regulations and conditions relating to the use, operation and possession of the equipment.

(ii) At his expense, cost and risk to store, keep and maintain the equipment in good repair and operating condition at all times during the term of this agreement subject to the warranties hereinafter set forth.

(iii) To be liable to the Company for the first $100.00 of each claim for loss or damage arising out of collision, upset or overturn and, for the first $25.00 of each claim for loss or damage arising out of theft, vandalism, or malicious mischief.

(iv) Not to assign or sublet the equipment or this agreement or any interest herein without the prior written approval of the Company.

(v) Not to transfer, sell, lease, mortgage, pledge or otherwise encumber the equipment or any part thereof or permit the equipment to be encumbered or suffer any lien or legal process to be incurred or levied thereon.

(vi) To pay all costs, expenses, fees (including license fees), fines, penalties, charges and taxes (except income taxes of the Company) against either or both of the parties hereto resulting from the use, operation and possession of the equipment during the term hereof. If said costs, expenses, fees, penalties, charges or taxes are paid by the Company the Holder shall immediately upon demand reimburse the Company for such payment.

(vii) Not to affix or install any accessories, attachments or devices to the equipment which will impair the Company's intended function or use of the equipment; that all repairs, service parts, supplies, accessories, attachments and devices attached, affixed or installed to the equipment or part thereof shall become the property of Company unless same may be removed without damaging the equipment or affecting in any way the Company's intended function and use of the equipment.

(viii) That the equipment is to be considered for all purposes as personal property and that the equipment shall not be affixed or attached to real estate or other personal property except with the prior written consent of the Company.

(ix) That the equipment shall not be removed from the county in which the Holder's said address is located without the prior written consent of the Company.

(x) To indemnify and save harmless at his expense the Company from and against all claims, demands, suits and actions, alleging damages to persons or property occasioned by or alleged to have been occasioned by any equipment leased hereunder and its ownership, maintenance, use, operation or storage during the term of this agreement; this indemnity shall not be affected by the termination of this agreement.

(xi) That the acceptance of delivery of the equipment constitutes the Holder's acknowledgment of the size, design, capacity and manufacture selected by the Holder and that such equipment is suitable for the purpose intended by the Holder.

(xii) That if he fails to pay when due any rent or other amount required herein to be paid to Lessor by Holder, Holder shall pay to Lessor a service charge of Ten Dollars ($10.00) for each month or part thereof for which said rent or other amount shall be delinquent, plus interest on such

delinquent payment from the due date thereof until paid at the rate of six per cent (6%) per annum. X

5. The Company covenants and agrees:

(i) To guarantee to the Holder, when not in default hereunder, peaceful possession of the equipment during the term of this agreement.

(ii) To give the currently published warranty relating to Company products leased hereunder which is in lieu of and excludes all other warranties and conditions expressed or implied, and the Company neither assumes nor authorizes any person to assume for it any other liability in connection with the said equipment or the leasing thereof:

It is expressly agreed that the warranty and agreement applies only to new, unused products, there being no warranty of any nature in respect of used products or such products that have been repaired, altered, neglected or used in any way which, in the Company's opinion, adversely affects its performance.

(iii) To assign and does hereby assign to the Holder during the term of this agreement any warranty of an outside manufacturer issued on equipment leased hereunder not manufactured or sold by the Company.

(iv) Subject to Paragraph 4(iii), to provide at its own expense property insurance to cover all risk of direct physical loss or damage, except loss or damage occasioned by:

(a) wear, tear, gradual deterioration, inherent vice, latent defect, corrosion, rust, freezing.

(b) mechanical or electrical breakdown or failure, repairing, adjusting, servicing or maintenance operations.

(c) infidelity of Holder's employees or persons to whom insured equipment is entrusted.

(d) unexplained loss, mysterious disappearance.

(e) blowout or puncture of tires and tubes except where such damage is coincident with other loss or damage insured by the policy issued to the Company.

6. The Holder may at any time during the term of this agreement pay one or more rental payments in advance of the due date(s) thereof.

7. Upon the termination of this agreement:

(i) The Holder shall upon demand return and deliver the equipment to the Company, at such place as may be designated by the Company which is not more than 50 miles from the location of the equipment in the same condition as received by the Holder except for reasonable wear and tear and damages by any cause covered by collectible insurance, the proceeds of which have been paid to the Company, or

(ii) The Company may reinstate this agreement for a successive twelve month period at an annual rental payable in advance to be determined by the parties hereto provided the Holder is not in default hereunder and gives to the Company 45 days written notice prior to the said date of termination of his desire to so reinstate, or

(iii) The Holder may arrange for the immediate sale of the equipment in accordance with provisions of the following paragraph eight.

8. The Holder, notwithstanding paragraph 2 herein, may, upon written notice to the Company, elect at any time during the lease term to terminate this agreement provided he promptly arranges for the bona fide sale of the equipment in the open market; if the Company gives its written approval to such sale, it shall, when requested by the Holder in writing, execute all bills of sale and other documents necessary to consummate such sale and transmit same promptly to the Holder in consideration of which the Holder agrees to remit promptly to the Company the net proceeds of sale of the equipment after deducting all expenses incurred by the Holder with respect to such sale. Nothing herein contained shall preclude the Holder from being a purchaser at any such sale held as a public sale or auction.

9. Notwithstanding paragraph 2 herein, the Company shall, upon receipt of (a) the net proceeds of sale as described in preceding paragraph eight; (b) the proceeds of any insurance payable due to the loss or destruction of the equipment; (c) the net proceeds of sale of the equipment wreckage due to destruction of the equipment, add the total thereof to all rental payments paid by the Holder to the Company hereunder. If the resulting total exceeds the total rental and other sums required to be paid by the Holder hereunder during the entire term of this agreement, then the Company, if the Holder is not in default hereunder, shall refund to the Holder such excess amount. If a deficiency sum results from the above calculation, the Holder shall pay to the Company such sum promptly upon demand.

10. Upon default by the Holder in the payment of any amount due hereunder, whether as rental or otherwise, or upon the violation by the Holder of any of the terms or conditions hereof, and the Holder fails to remedy such default or violation within 10 days after written notice is given by the Company so to do, or if the Holder commits any act of bankruptcy as defined by the Bankruptcy Act or is adjudicated a bankrupt or becomes insolvent or takes the benefit of any Act or Statute that may be in force for bankrupt or insolvent debtors, then the Company at its option by written notice to the Holder may declare that the rentals for the entire unexpired balance of the term of this agreement shall become immediately due and payable and terminate this agreement and all rights of the Holder in and to the equipment shall cease; and the Company or its agents and employees may without further notice or legal process take possession of the equipment wherever found and for that purpose may enter upon any premises of the Holder. The Company shall be entitled to retain all rentals and any other sums paid to the Company hereunder and shall be entitled to recover from the Holder, as liquidated damages and not as a penalty for the breach of this agreement, all unpaid rentals and other sums payable by the Holder hereunder and all costs and expenses, including court costs and attorneys' fees incurred by the Company in the enforcement of its rights and remedies hereunder. Time is of the essence. X

The Company may, but shall not be obligated to, re-lease or sell publicly or privately the equipment or part thereof during the otherwise unexpired term hereof to such persons and on such terms as the Company shall determine and the net proceeds of such re-leasing or sale for the period prior to the otherwise expiration of this agreement shall be applied to the Holder's obligations hereunder and the Holder shall pay the deficiency. The Company at said private or public sale or auction may bid for or purchase any or all the equipment. Any repossession as aforesaid by the Company and any sale or re-lease made by the Company of the equipment shall not affect the right of the Company to recover from the Holder damages which the Company has sustained by reason of the breach of the terms of this agreement by the Holder.

11. It is the intent of this agreement that the Company shall receive the rent hereunder as a net return on the equipment leased hereunder.

12. The Company's rights and remedies as related to any of the terms and conditions of this lease shall be cumulative and not exclusive, and shall be in addition to all other rights and remedies in its favor.

13. The Company's failure to enforce strictly any provisions of this lease shall not be construed as a waiver thereof or as excusing the Holder from future performance.

14. If any provision of this lease or the application of such provision shall be held illegal or unenforceable under any laws of any jurisdiction applicable to this lease, the remainder of this lease or the application of such provision to other persons or circumstances shall not be affected thereby.

15. All notices shall be binding upon the parties hereto if sent to the address set forth herein, unless a subsequent address has been furnished, by certified mail, by one party to the other.

16. Subject to paragraph 4 (v) hereof, this agreement shall bind and enure to the benefit of the heirs, executors, administrators, successors and assigns of the parties hereto.

17. This lease constitutes the entire agreement express or implied between the Holder and the Company. Any change, amendment or modification to this lease must be in writing and signed by the Holder and Company.

18. Words used in the singular, masculine and neuter include the plural, feminine and neuter where the context or the parties hereto so require.

IN WITNESS WHEREOF, the Holder has duly executed this lease on the date first above written.

WITNESS: ______________________________ HOLDER (TRADE, PARTNERSHIP OR CORPORATE NAME)

______________________________ By ______________________________ Title

______________________________ By ______________________________ Title

Accepted this ________ day of ______________ 19 ____, at ______________________

______________________, ______________________, ______________________

Massey-Ferguson Industries Limited

By ______________________________ General Sales Manager

REV 12 64
MF-1907-(CANADA)

The Deferred Payment or Waived Finance Charge Plan

Massey-Ferguson believes that dealer and farmer acceptance of its plans is indicative of their usefulness. This usefulness is based on careful tailoring of the plans to dealer and customer needs. Perhaps the best example of evolving sophistication in the company's financial plans is the deferred payment or waived finance charge, plan on out-of-season machines. MF believes this plan uniquely blends mutual accommodation of customer demand and financing, dealer operation and manufacturing economics.

In order to achieve maximum efficiency, year-round manufacturing is required, especially of major seasonal machines such as combines. However, the seasonal nature of most farming operations has traditionally created a corresponding and --from the manufacturer's viewpoint --significant fluctuation in the demand for seasonal machines. Obviously, and sensibly, the farmer is reluctant to tie up capital by buying a combine in, say, December, when he would not use it until the following harvest.

Similarly, the dealer --although he has the advantage of interest-free, one-year floor plans --is reluctant to stock machines he knows his customers will not require for many months. The dealer prefers to initiate his floor plans immediately prior to the season of use, thus minimizing his risk of an inventory carry-over past his interest-free year.

In order to reconcile these conflicting but reasonable elements of self-interest, MF introduced the deferred payment plan. It works this way: the farmer orders his new machine, makes a down payment (trade-in, trade-in plus cash or cash) selects his repayment terms from those available under the MF finance plan and takes delivery during the off-season.

The dealer benefits from this program in that he closes pre-season sales, receives trade-ins early, reconditions them during the winter and has them ready for sale before the season of use.

The farmer benefits substantially from this transaction: the company waives the payment of finance charges for a period of one to eight months from the date of the retail contract and he is protected against any interim price increase that might occur and he does not begin repayment until 30 days prior to the beginning of the established season of use. (See "season of use" sheets, pages 14 through 17.)

The average yearly figures of retail notes outstanding under the deferred payment plan from 1961 to 1966 shown on the following page are an indication of the farmer's acceptance of that plan.

Deferred Retail Notes Outstanding: 1961 - 1966

	Canada	U.S.
	(millions of dollars)	
1961	5.0	2.9
1962	7.7	3.4
1963	8.4	7.8
1964	9.9	15.2
1965	16.9	24.0
1966	20.0	30.7

These figures can be interpreted to lead to two conclusions: (1) the acceptance of the deferred payment plan in North America has been surprisingly high; this would seem to indicate the plan's effectiveness in meeting farmers' needs, and (2) the Canadian farmers' need for this plan may even be greater than that of U.S. farmers, who outnumber Canadian farmers about eight to one, because of the higher degree of seasonality that prevails in Canada.

Waived Finance Charge and Special One-Time Programs

From time-to-time, the company offers limited-duration programs of financial assistance to the farmer. These might be considered sales promotion programs as opposed to the company's on-going financial assistance plans. Such special programs may be limited to one item of machinery or they may include the entire line; their durations vary;

and the specific features which encourage the potential customer to buy may also vary. One such current program, initiated in July 1967, waives finance charges until January 1968 on the purchase of any new or used MF agricultural tractor. This particular program also offers waived finance charges for varying durations on other MF machinery.

PROPORTION OF MF-FINANCED SALES

The Commission has asked, "What proportion of your sales are financed by you?" In 1966, acceptances of time payment contracts as a percent of retail sales was 47.3 percent. This compared with 20 percent in 1960. The U.S. figure for 1966 was 37 percent. The following points, however, should be borne in mind in considering these figures:

- since as purchases require approximately a 20 to 40 percent down payment, the percentage of acceptance, correspondingly, could never be higher than 60 to 80 percent of total retail sales. Many customers, of course, exceed the required down payments to minimize their outstanding debt;
- with regard to return to the company, deferred time payment charges earn nothing for the company until payment begins 30 days prior to the season of use of the piece of equipment in question. The company carries

life insurance on the contract holder and collision and malicious damage insurance on the machine in the interim. Thus, in these cases MF subsidizes the farmer's use of retail instalment credit;

- finally, all MF customers enjoyed a prepayment privilege at no penalty long before recent legislation made partial repayment of finance charges mandatory. In practice, many of them take advantage of this. Of course, the customer receives full adjustment on the unearned finance charges.

* * *

In summary, this chapter has described the evolution and present status of MF's financial assistance plans for dealers and farmers. These include:

<u>Dealer Plans</u>

- Parts:
    - master stock order
    - fall stock order
    - bi-weekly replenishment stock order

- new machine base stock order
- new product parts stock order
- new dealer initial stock order

- Machines:

  - machine floor plan (new)
  - machine floor plan (used)

- Other:

  - dealership equipment plan

Retail Plans

- MF finance plan
- deferred plan
- waived finance charges and special one-time programs
- special products plan
- equity financing plan
- equipment leasing plan

It should be noted that all MF financing plans offered in Canada

and the U.S. are virtually identical. Slight variations do occur in the contractual provisions and finance charge rates to conform with statutory requirements of some U.S. states. These variations, however, do not substantially change the terms in any way so as to favor farmers on either side of the border. However, MF should point out that since prime interest rates in Canada tend to be somewhat higher than in the U.S., Canadian farmers receive more favorable treatment from MF than they might receive from companies that vary their retail finance rates between the two countries.

In addition to MF's uniform rates providing this relative advantage to all Canadian farmers, they provide a certain additional benefit to farmers in Alberta and Saskatchewan. In those provinces there exist what MF considers exceptionally severe credit laws favoring the debtor. The effect of these laws is to raise MF's total farm machinery financing expenses through losses the company must absorb under the provincial laws. MF, however, to date has not raised its finance charges there to compensate for its additional costs.

The Alberta and Saskatchewan situations illustrate the company's belief that its financing activities are administered in the farmer's best interest.

MF believe its plans are desirable and have been accepted because they have fulfilled several necessary functions. They have enabled

farmers to acquire machinery which they might not otherwise have been able to purchase.

By so doing, the plans have also enabled the company and its dealers to produce more sales. Furthermore, they have accommodated MF's manufacturing schedules and probably have helped to increase the company's manufacturing efficiency. Perhaps most important, they have been a powerful influence in building and maintaining the efficient dealer organization required to serve the farmer.

Chapter XI

INDUSTRIAL AND CONSTRUCTION MACHINERY (ICM)

As explained in the opening chapter of this brief, two or even three, geographical operations units may exist in the same area. This is the case today with regard to the industrial and construction machinery (ICM) group-North America. It co-exists with the farm machinery group-North America.

HISTORICAL BACKGROUND

Massey-Ferguson entered the ICM market through the Ferguson merger which added industrial tractors to the line. In 1957, the company was offered the chance to purchase Midwestern Industries of Wichita, Kansas. Midwestern sold front end loaders, backhoes, dozer blades and scrapers. MF was familiar with this company and, in fact, had been purchasing some of its products for distribution and sale through MF dealers. Midwestern enjoyed a prominent position in the light industrial market, was selling a well-regarded product and, as a company, was considered one of the top three in the field.

Within MF, opinion favored the purchase for the savings Midwestern's line of machinery would offer in engineering and development costs as compared to the expense necessary for it to engineer and develop similar new products of its own. The acquisition also fell in line with the

company's then embryonic policy of maximum internal manufacture. Thus, on July 1, 1957, Midwestern Industries became a division of MF's U.S. subsidiary. Products were sold initially through both the former Midwestern distributors and MF branches. The engineering function remained in Wichita until 1959 when it moved to Detroit. The following year, the ICM marketing management was consolidated with farm machinery marketing in Toronto. In 1961, the manufacturing operation itself was moved to Detroit, partly to reduce transportation costs. The Wichita plant was closed.

Meanwhile, MF was not neglecting opportunities for overseas expansion into the industrial and construction market. In 1960, MF acquired G. Landini and Figli, S.P.A., the second largest Italian tractor manufacturer. This company manufactured both wheel-type and crawler tractors. Although both types were used for agricultural purposes, MF had never before produced a crawler.

The Landini crawler engineering and manufacturing skills acquired through this purchase enabled the company to design and manufacture an industrial crawler and strengthen itself in the industrial and construction market.

By 1964, the company needed more factory space for its growing line of industrial machinery. This led to the purchase of the Vickers Incorporated plant in Detroit. This acquisition relieved pressure on the North

American Tractor Plant (NATP) whose assembly line no longer had to produce finished industrial machinery, i.e., loaders, backhoes, fork-lifts, etc. Some finished industrial tractors were still assembled at NATP.

The purchase also signaled the advent of a formalized industrial products operation within North America. The new Detroit facility became the consolidation point for ICM engineering and certain ICM marketing functions such as product planning which began to separate from farm machinery marketing management in Toronto. Early in 1967, the formation of ICM operations in the U.S. culminated with the establishment of an ICM marketing group in Detroit, responsible for all marketing strategies and marketing actions related to ICM operations.

IMPORTANCE OF ICM MARKET

Since the acquisition of Midwestern Industries in 1957, the industrial and construction machinery market has continued to grow in importance. Today, it offers growth potential comparable to the farm machinery market.

This potential springs from the continuing growth of the economy and population both in North America and abroad. Population expansion is necessitating more public works, factories, houses, highways, offices, apartments, churches, schools and shopping facilities. At the same time,

in the western world at least, the apparent growth of leisure time is creating a demand for more recreational facilities.

The demand for this machinery is not limited to this continent or even to the western world. The developing countries of Africa, Asia and Latin America have also demonstrated their demand for a variety of industrial and construction machinery.

When MF entered to ICM field, it did so primarily by modifying existing agricultural machinery, particularly tractors. The ICM line today has grown to include specially-designed industrial tractors; two- and four-wheel-drive tractor shovels; crawler dozers and crawler loaders; rough terrain forklifts; backhoes; tractor-mounted loaders; forestry machinery; turf tractors and other landscaping equipment. Industrial and construction machinery is, of necessity, quite specialized. MF's ICM group has the capability to meet the specialized equipment needs of its market.

The opportunities in the industrial and construction machinery market have proved very real. MF's ICM sales worldwide in 1961 were $27 million. In 1965 they totaled $59 million. In 1966 they rose 27 percent to $75 million exclusive of service and parts. A major part of this volume was achieved in North America; there were also large percentage increases in France, Australia and the export markets.

PRESENT FACILITIES AND EXPANSION

The company's ICM facilities, at first part of the tractor operation in Detroit, now include major engineering and manufacturing sites in Italy, England and Detroit. The Detroit facility, however, is now being closed. Its functions are being transferred to a recently acquired 322,000-square-foot plant at Akron, Ohio.

This fall the Ohio plant becomes the site of all North American ICM marketing and manufacturing operations except for certain industrial tractors which will continue to be assembled at the North American Tractor Plant in Detroit.

The Akron site was selected because of the plant's price and design -- a new plant being necessitated by the expansion and greater production volume of products needed to serve the growing ICM market. Other expansion in this field includes a new 350,000-square-foot manufacturing plant under construction on a 62-acre site south of Rome where much of MF's line of industrial and construction machinery will be built.

MASSEY-FERGUSON LIMITED'S ICM GROUP

The worldwide ICM market which these facilities now serve may well double to about $1.4 billion within the next ten years. With such market potential in mind, MF established, in 1966, a separate ICM product group

within the parent company to ensure the development and expansion of MF's business in this product area. This group, and the geographic operations units presently being developed to function under it, will provide the separate management direction and specialized engineering and marketing skills required to meet the needs of ICM customer.

These customer needs require an approach significantly different from that associated with farm machinery. Because of rapidly changing ICM market and customer requirements, it is often necessary to accelerate the development of new products and the modification of existing designs. In addition, production runs are typically short and involve many models and modifications for individual markets or customers.

To expand its ICM market, Massey-Ferguson must cater to customers with varying economic problems, equipment needs and buying habits. Dealers servicing these customers must be located in fast-expanding urban and suburban areas, as well as in agricultural areas, and must be able to provide a broad product line with emphasis on parts and service availability.

The ICM group at the parent company consists of an engineering division, a distribution division, a product planning division, a parts and service division and a market and economic research section.

The parent company ICM group is responsible for:

- developing plans for expansion of the industrial and construction machinery business, including worldwide product strategies designed to improve the company's market penetration;
- providing staff services for existing ICM activities.

Evolution of ICM Operations Units

At present, there are two geographic ICM operations units, one in North America and one in Italy. Much of the ICM activity at the parent company is directed, as indicated, at adding new ICM operations units in other areas. Coincident with these organizational activities, MF is engaged in major product expansion and development programs to serve both existing and new ICM markets.

With the exception of the North American and Italian ICM operations units, farm machinery operations units are responsible for the manufacture and/or sale of ICM products in their areas and will remain so until ICM units are established in their respective areas.

Among the prime short-term goals of the parent company's ICM group, is preparation for these distinct and separate ICM operations units. This will be achieved through the extension of ICM specialization, with particular emphasis on marketing, in existing farm machinery operations

units. Such genesis of ICM units is evoluntionary and largely dependent on the refinement of skills already present within the worldwide enterprise.

The pace at which separate geographic ICM operations units will be formed depends on specific market-by-market potentialities. The first step toward a separate ICM operations unit will ordinarily be the formation of an ICM division within an existing farm machinery operations unit. Such divisions will provide specialized direction for the engineering, manufacturing, marketing and servicing of industrial and construction machinery.

At a later stage, these divisions will be separated from their respective farm machinery units and become independent ICM operations units reporting on a line basis to the group vice president-ICM. To minimize organizational fragmentation, and prevent unnecessary administrative duplication, it is likely that an independent ICM operations unit will continue to obtain many supporting services from the farm machinery operations unit from which it has disengaged.

This relationship is typified in North America today by the farm machinery and ICM operations units. The North American ICM operations unit, which reports directly to the group vice president-ICM, draws comptroller, planning and procurement, management services, personnel and industrial relations and public relations support from those respective departments

which are structurally within the North American farm machinery operations unit.

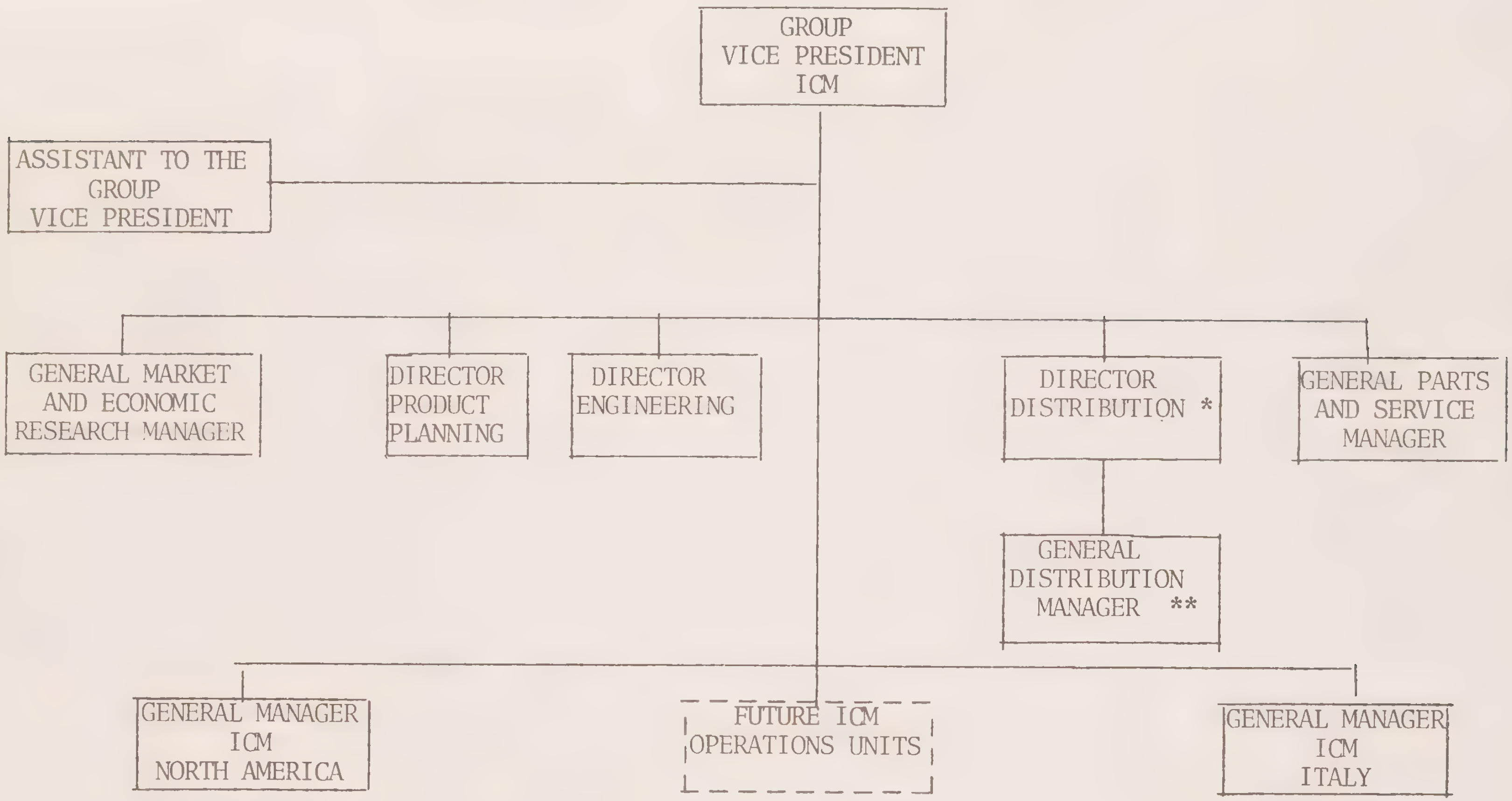
Organization of ICM Group

The ICM group at the parent company (see following chart) provides the other operations units of the worldwide enterprise with the staff assistance which will result in the eventual establishment of additional ICM operations much in the pattern of North America. In so doing, ICM group executives discharge the following responsibilities:

Director engineering: provides technical leadership required to carry out the planned expansion and upgrading of Massey-Ferguson's ICM product line. He is accountable for all research and advanced development activities carried out by the ICM group; for providing technical assistance in the development of product strategies and proposals for ICM products; for coordinating design activities of engineering departments within the group; and for ensuring the proper administration of engineering activities.

He is responsible for spearheading the development and/or application of technological ideas that will result in substantial cost reductions or performance improvement for Massey-Ferguson's ICM products. He advises as to the technical feasibility and design costs of new types of machinery that are under consideration. In this regard he ensures that

ORGANIZATION OF INDUSTRIAL AND CONSTRUCTION MACHINERY GROUP



* Primary concern currently is distribution in Canada and the U.S.

** Functional concern world-wide excluding Canada and the U.S.

operations unit engineering departments perform analyses and draw together the information necessary to translate general requirements (speed capacity, range of operating conditions and approximate selling price), into detailed product definitions which include specific features, basic dimensions, weight, power, and cost targets for manufacturing and tooling.

In addition, the director engineering proposes new products based on technological improvements that could have major commercial impact. He also provides technical direction and coordination to the chief engineers of operations units for all ICM product design activities. During the product testing stage, he reviews the results of prototype field and laboratory tests and assesses the technical feasibility of introducing the new product at the point in time required to achieve maximum marketing impact.

His responsibilities for product development extend beyond purely technical decisions. He reviews and advises on product development projects to ensure that they meet time, cost and performance targets. Where he finds deviations in engineering aspects, he works with the general managers and chief engineers of operations units to initiate corrective action.

The director engineering also works with these same operations units' executives to assign development and design projects to their engineering

departments and to ensure proper engineering administration and control. In addition, he provides guidance in helping them to evaluate expenditure levels for engineering activities under local control, i.e., maintenance of design, cost reduction/value analysis , and design studies for new products.

The director engineering also coordinates the development of service engineering sections in the operations units. These sections will provide direct technical support to service activities and supply important feedback to design engineers on actual product performance.

Director distribution: develops programs for building a strong worldwide dealer organization that will ensure maximum direct sales of ICM products, parts and service. He works with the director product planning to review the market potentials for existing products, to determine what new product opportunities can be exploited and to ensure that the overall plan is consistent.

Working with the operations units, the director distribution identifies the alternatives available for establishing or expanding ICM distribution in each market and then determines the most appropriate channels. This includes deciding whether farm machinery distribution channels can cover the market or whether separate industrial distributors should be added or substituted.

He makes sure the ICM dealer network is supported with adequate promotional and financial merchandising programs. Promotional programs includes those activities designed to recruit and retain ICM dealers, as well as advertising and product literature intended for the end user. Financial merchandising programs are designed to put the product in the hands of the end user in a manner that best meets his special requirements. In addition, the director coordinates such matters as dealer coverage, dealer training, techniques for selling used equipment and he reviews all ICM pricing.

In addition to these planning activities, the director distribution assists operations units in the implementation of programs. These include, for example, the planned separation of the ICM and farm machinery dealer networks and the introduction of new products.

The director distribution also works with marketing and product management in the farm machinery group to ensure that ICM programs adequately take cognizance of farm machinery plans. This contact is vital while industrial and construction machinery is still being sold through farm machinery operations units.

Director product planning: recommends new ICM products for world markets. He analyzes data on the existing Massey-Ferguson industrial and construction machinery line and reviews competitive industrial and construction machinery trends in conjunction with the market and economic research

section. He then recommends additions to the product line that will strengthen Massey-Ferguson's position in the market. In so doing, he must consider manufacturing compatibility with current products, suitability for the ICM distribution network and the extent of potential component interchangeability with other products.

The director product planning recommends priorities for the development of individual new products within the expanding scope of the ICM line. Following approval of these priorities, he assists in the definition of specific products. This involves working closely with operations units and the director engineering to ensure that new products meet market requirements, yet can be manufactured at a competitive cost. He must review new product plans with the director product planning-farm machinery to provide optimum component interchangeability between the two groups.

He also develops plans for the introduction of new products and ensures the coordination of these plans with the farm machinery group.

The director product planning draws heavily on the operations units for basic information to assess new product potentials. He reviews with them approved product strategies and assists them in defining specific products within that framework. In addition, he works with them to develop revisions to these recommended strategies.

He also works with the director distribution to determine whether or how new product proposals will fit prospective changes in the distribution network. And he works with the director engineering to assess the design feasibility of new products under consideration.

General parts and service manager: is concerned with the enhancement of parts and service quality and availibility outside of North America. Within North America these responsibilities are lodged in the ICM operations unit.

General market and economic research manager: informs the group vice president, group staff and other appropriate personnel about competitive, economic and political factors affecting ICM industries and markets worldwide. He provides the ICM group staff with current, reliable information on trends in customer preferences, product features, distribution patterns, costs, general economic trends in public policy, etc. He suggests possible strategy implications of this intelligence.

He develops and maintains long-and-short-term forecasts of the demand for current and proposed ICM products and identifies the level of confidence appropriate to the data from which he has developed his forecasts.

He obtains current, accurate and comprehensive information from operations units required for effective decision-making. Conversely, he provides ICM market and economic research counsel and assistance to ICM operations units

and to farm machinery operations units with ICM responsibilities.

ICM AND FARM MACHINERY

The question exists of the relationship between the manufacturing and marketing of ICM products and the manufacturing and marketing of agricultural machinery.

Massey-Ferguson considers its expansion into ICM products a natural extension of the skills and capabilities that were inherent in MF prior to entering the ICM field. To fully serve this field, however,refinements were required in MF's functional structure. These refinements included the formation of specialized ICM engineering, manufacturing and marketing segments within the worldwide enterprise.

Despite the necessity for these specialized functional segments, there are economies of scale in the engineering-manufacturing process derived from a base which includes both farm and industrial and construction machinery. This base also includes the benefits of greater volume of raw material purchases.

Engineering, as a function, contributes through its continuing concern with commonality of design and interchangeability of components. Coordination between farm machinery and ICM engineers pays off to some extent by minimizing duplication of effort on the drawing board; it pays

off more in the extent to which the production run of an individual component will satisfy the needs of both the farm and ICM assembly lines. There are, of course, stringent limitations in this regard stemming from the basic differences in the requirements of farmers and industrial and construction machinery users --and stemming from the greater material strengths often required in construction machinery.

Among ICM products, there are obvious differences necessitated in front or rear end configurations relative to backhoes, loaders, shovel loaders or lifts not normally associated with agricultural tractors. Differences are also evident in many of the wheel sizes and in the sheet metal configuration. Internally, many ICM products require heavier duty axles, front axle supports, more powerful hydraulic systems and many have special transmissions which permit instant reversing. This instant reverse capability also necessitates heavier duty clutches and heavier rear axle internal drive gears.

Still, there is substantial commonality between the core, i.e., the chassis and major transmission elements, of the red agricultural tractor and its counterpart yellow industrial tractor. This commonality enables MF to use the same components and the same facilities for the assembly of some agricultural and industrial tractors. Factory accounting procedures, of course, guarantee that farm and industrial tractors each absorb their proper respective share of factory burden expenses.

Thus, in the design of and tooling for certain components and in the assembly of these components in tractor cores, commonality allows intensive use of facilities with attendant reduction of overhead on a per-unit basis. The purchasers of both the red agricultural and the yellow industrial machinery benefit from this farm-ICM/engineering-manufacturing rationalization.

ICM MARKETING

Red is red, and yellow is yellow; yet the twain do meet. They also meet in the marketing process. In Canada the entire ICM sales responsibility is still lodged with the farm machinery sales organization, namely the Canadian sales division of the marketing department of the farm machinery group - North America.

In the U.S. there are four sales divisions (western, central, north central and eastern) which report to the director marketing of the ICM operations unit - North America. These divisions were established last January. The company's experience in the disengagement of farm and ICM marketing in the U.S. will be adapted as applicable to Canada.

All dealer sales agreements in Canada cover both farm and industrial and construction machinery. In the U.S., separate agreements cover these two categories and a dealer may or may not hold both.

The vast majority of the ICM market is concentrated in a relatively few areas which are experiencing exceptionally intense urban development, exceptionally rapid suburban expansion or some combination of both. It is not unusual, in the U.S. pattern at least, for outlying dealers in these areas to find the nature of their market changing from farm to ICM. As the city's suburbs have grown, they have devoured the surrounding farm land.

Thus, several MF dealers, now deprived of a good portion of their former agricultural sales, are competing with each other and with others in the industry to supply the area's industrial and construction machinery needs. But with so many suppliers fragmenting the market, few or none can afford the investment in service and sales staffs and the machinery itself necessary to service their areas. The solutions to such problems are now being worked out in the U.S. and, again, will be adapted, as applicable, to Canada.

More typical, however, both in Canada and the U.S., is the dealer who is located in a truly rural area with little prospect of substantial suburbanization. His sales agreement may well entitle him to sell industrial machinery. But chances are that the industrial equipment he actually does sell is far less complex and far less expensive than that sold for heavy construction in cities and suburbs. The industrial machinery the rural dealer sells, therefore, does not compete for the dealer's personnel or financial resources against the farm line which makes up 85 to 95 percent or more of his volume.

* * *

In summary, it is MF's view that the extension of its business into the industrial and construction machinery field is a natural employment of the company's basic resources and thus offers economic advantage to all the company's customers. The two lines, farm and ICM, although requiring a significant degree of engineering, manufacturing and marketing specialization, are far from incompatible either within the MF worldwide enterprise or its operations in North America.

Chapter XII

SUMMARY

Last January the Royal Commissioner informally stated his goals as:

> (ensuring) "...that the farm machinery industry will turn out a quality product at a reasonable price and provide the farmer with the services he needs and that it will continue to do so for years to come."

Massey-Ferguson fully shares these goals. Indeed they have been MF objectives for many years. The company believes that its record, extending back 20 years earlier than Canadian confederation, establishes that MF has and is continuing to achieve these goals.

AN ADDITIONAL GOAL

The company must, however, add and explain one further MF goal. That goal is profit. To some "profit" is an objectionable word and implies exploitation and greed.

Canada's economy, however, is basically a capitalistic economy; that is, an economy based on the profit motive. The contrast in the general

level of public welfare between Canada and those nations which have chosen to subjugate or to attempt to negate the profit motive, MF believes, clearly exemplifies the superior value, in terms of greater efficiency and of greater individual well-being, offered by the capitalistic system.

Massey-Ferguson makes no apologies for its belief in profit and its profit-directed endeavors.

The company's brief, through the illumination of the many facets and problems of this business and of MF's approach to solving these problems, should substantiate that Massey-Ferguson indeed shares the Commission's goals, if for no other reason than, as businessmen, the achievement of these goals is the requisite intermediate step to the long-term achievement of profit.

A Dual Concern

Massey-Ferguson realizes that farm machinery prices are of concern to the farmer who has had to face increasing production costs.

MF too has faced such cost increases and correspondingly has had to increase its prices, but MF's prices have not risen out of proportion to its increased engineering, manufacturing and marketing costs.

Indeed, had MF's own internally induced efficiency not grown over recent years --a result, in part, of the company's internationally

integrated engineering, manufacturing and marketing-- MF would not have been able to limit its farm machinery prices to their present levels in the face of escalating costs.

For example, the average gross hourly earnings of MF's Canadian wage employees rose from $2.35 in 1960 to $3.34 in 1966 --an increase of slightly over 42 percent.

Considering the farm machinery industry as a whole, MF believes that intense competition precludes the possibility that price increases can be explained by excessive aggregate profit.

Massey-Ferguson believes that profit is a false issue, an issue that was early seized upon by some persons and amplified for the easily-grasped elements of conflict and aura of controversy it offered. An examination of its profits, MF believes, would lead to the conclusion that these profits have been extremely modest.

Massey-Ferguson also believes that dispassionate consideration of farm machinery profits by independent and objective experts such as those whose services are available to this Royal Commission must lead to the conclusion that neither prices nor profits in the farm machinery industry are out of line; rather, MF believes that many such experts would conclude that the farm machinery industry must be characterized as a low-profit industry.

use of uniform processes, procedures and materials; it also means the interchangeability of machine parts or components.

With regard to the number of different types of parts, the term standardization sometimes refers to the reduction of the total number of similar parts in a machine. For instance, 57 nuts and bolts of slightly different dimensions in a tractor or combine might be "standardized down" to half a dozen.

The Economy of Commonality

All of the above types of standardization might be considered internal from the standpoint of any one farm machinery manufacturer. In Massey-Ferguson, they are all practised for the economies they produce both in an immediate, ease-of-operation sense and, just as important, they are practised because they are dictated by the practical demands of MF's international manufacturing complex and the engineering resources which support it.

Without component commonality, the company would automatically sacrifice much of the economic advantage of its internal component manufacture and cross-sourcing. However, it should be borne in mind that economic reality leads to an optimum level, rather than an absolute achievement, of standardization and interchangeability.

The Limits of Interchangeability

The term standardization has also been used to express the opinion that parts should be interchangeable not only among farm machinery models in one company but among all models of all companies. Indeed, the suggestion has been offered that farm machinery manufacturers be supplied designs and plans for fundamentally new machines by outside research and engineering institutions under government contract. Under such a suggestion the manufacturer would still be responsible for design adaptations to production requirements.

Inferior Quality: A Possible Consequence

On the surface, such suggestions would mean, effectively, government entry into the business of engineering farm machinery; these suggestions also presuppose the necessary expertise. At the risk of oversimplification, were such expertise available, the farm machinery industry in Canada would then find itself competing solely on the basis of manufacturing and marketing efficiencies, for the manufacturers would have little or no control over the engineering quality of their respective machines. Conceivably manufacturers, if they wished to compete in the Canadian market, might find themselves forced to produce machines of inferior quality which could not satisfy consumer needs.

The basic suggestion for government-sponsored machine design apparently stems from a relative lack of basic or fundamental

research sufficiently oriented to farm machinery engineering requirements. Data on optimum depth, temperature, moisture content, pressure, fineness and uniformity of soil, etc., it is suggested, would enable engineers to produce better designs for tillage and harvesting machines.

There may be some elements of truth in such suggestions. However, the argument is incomplete inasmuch as it implies that a small number of government designs would satisfy all Canadian agricultural conditions. The government-sponsored design suggestion, as indicated above, takes cognizance of the individual manufacturer's need to adapt such designs to its own production requirements.

The extent to which these adaptations themselves would have to be standardized to preserve the basic intent of the suggested program is a further question which shall not be discussed here. Massey-Ferguson shall comment, however, that it does not agree with the assumption that outside engineers who might contribute designs would possess engineering skills superior to those available from MF's engineering staff.

If independent research and engineering organizations were responsible for machine design, and if the use of such designs were incumbent upon the industry for machinery sold in Canada, Massey-Ferguson believes that a major dislocation of the integrated inter-

national engineering-manufacturing-marketing structure of this company would be inevitable.

When one considers the interactions of the engineering, manufacturing and marketing functions required to satisfy customer needs it becomes evident that the suggested independent engineering organization would have to become involved with the manufacturing and marketing considerations of each individual manufacturer.

If this were not possible, as it probably would not be, the individual farm machinery manufacturer would have to face the alternatives of (1) total reorganization to accommodate the outside prescription of designs for Canadian farm machinery; in effect, this would mean the total isolation or perhaps virtual severance of Canadian operations upon the part of international manufacturers with concomitant escalation in administrative and production costs; or (2) the abdication of the Canadian market.

The latter possiblity, of course, implies consequences in terms of manufacturing site locations and balance of trade --were imported machines, not conforming to Canadian government specifications, to be permitted entry. Under either set of circumstances there would be major disruption of MF's internationally rationalized engineering, manufacturing and marketing complex. Further, there would be a reduction in the competitive nature of the industry. Both these

results would tend to lower efficiency and increase prices.

It was explained earlier that component standardization enables MF to take a transmission made in Sao Paulo, an engine manufactured in France, sheet metal parts from England and assemble a tractor to specification in Detroit. The mix could be altered to include other factories in India, Italy and Mexico.

Similar integration is being established in combine manufacture among plants in five countries. Such programs cut production costs by permitting long production runs where they can be most economically performed. The implementation of suggestions that have been made for radical standardization within Canada would eliminate the benefits, both to the farmer and to the company, of such programs based on MF's internationally integrated engineering and manufacturing complex.

The Inefficiencies of Overstandardization

It is not unreasonable, in the company's opinion, to suggest that "overstandardization" contains the seeds of more inefficiencies and detriments to progress than presently exist in what some view as a state of "understandardization". At some point in the drive to achieve industry-wide standardization, the abstract conceptualized ideal of standardization would sacrifice worthy innovation to bureaucratic order.

The resultant inefficiencies would affect both the farmer and the

company who share a continuing interest in economically practicable standardization. In terms of MF's present operation, standardization provides convenience and economies for both the company and the consumer through uniform processes, procedures and materials which reduce manufacturing expense in raw materials, labor and tooling.

Parts and component standardization permit longer, more economical production runs and more manageable inventories. These translate into further economies through the resultant interchangeability and cross-sourcing of components between manufacturing centres, and help enable the company to price competitively for the benefit of the farmer.

Current Standardization Programs

Massey-Ferguson, both unilaterally and in cooperation with other farm machinery companies, is continually engaged in standardization programs. In North America, MF employs 10 engineers and technicians whose sole responsibility is to develop production and design standards. Hundreds of standards covering procedures, processes, materials, finishes and parts have been developed and are used daily throughout the company.

At the industry level, organizations such as the Society of Automotive Engineers, the American Society of Agricultural Engineers, the Farm and Industrial Equipment Institute, the International Standards Organization and others to which farm machinery companies belong are

continually developing standards for industry-wide use.

FARM MACHINERY TESTING

The development and application of industry-wide standards parallels the development of farm machinery variations available to the farmer to meet his own peculiarly local needs. The proliferation of farm machinery necessary to meet these needs underscores one of the complexities inherent in farm machinery testing.

One of the recurrent themes of certain Royal Commission witnesses has been a desire for the institution or re-institution of a governmental or university farm machinery testing program. Suggestions as to the dimension and responsibility for such a program have varied. However, the suggestions have all been intended to provide the farmer with machine performance, durability and suitability data.

With these data in hand, the farmer can presumably select machinery more accurately to correspond with his exact operating conditions. Thus, the farmer would benefit in increased productivity, profit and, possibly, leisure. MF endorses these goals, but questions whether the suggested methods of achieving them are practical on the basis of economics, manpower or facilities they would require.

Practicability

There are, in the company's view, severe practical difficulties in executing a program which could provide truly meaningful results to more than a small percentage of Canadian farmers. These difficulties arise from the overwhelming variety of test conditions that would be required.

Consider the permutations possible among the following factors:

- type of crop;
- maturity of crop;
- basic type of soil, e.g., sand, loam, clay;
- porosity of soil;
- moisture content of soil;
- moisture content of crop;
- profile variation of soil;
- variation of local topography;

- variation of altitude;
- variations in conservation practices;
- temperature;
- humidity;
- wind direction;
- wind velocity;
- local or personal variations in machine use or management based on local custom or personal idiosyncracy.

Consider the explosive arithmetic of the problem. It can very crudely be estimated that these variables present approximately 46 million different sets of operating conditions. That figure must then be multiplied by at least 100 to accommodate the various machines of the different manufacturers. The result must then be multiplied by, say, 50 to provide for the various combinations among these machines, e.g., a competitor's implement with an MF tractor. Such mathematics produces the mind-boggling figure of 230 billion sets of conditions which might require analysis and comparison.

Even just considering the basic and arbitrarily-arrived-at figure of 46 million "test beds" it is obvious that each of Canada's 400,000-plus farmers must cope with about 115 different operating conditions. It seems reasonable, therefore, to state that any machine, even the most specialized, is a compromise in relationship to the variety of conditions under which it will have to operate.

Compromise seems to be the key word. However, it was the experience of the Saskatchewan Agricultural Machinery Administration, which was discontinued in 1964, that a corresponding compromise approach to testing is not satisfactory. As Saskatchewan agricultural minister Douglas McFarland stated with reference to the defunct AMA, "In order to do the right kind of testing, it should be done on a larger scale".

Just how large that scale might have to be is suggested by the permutations cited earlier.

Professor H. P. Harrison, department of agricultural engineering, University of Alberta, indicated a similar viewpoint: that individual machine performance can be adequately assessed only after extended operation under a variety of crop, soil and climatic conditions.

MF Machine Testing and Evaluation Programs

In order to ensure the reliability and suitability of the machinery it offers the farmer in fulfillment of his needs, the company has an

established sequence of machine testing and evaluation programs. With respect to any one product, this sequence begins in MF's engineering laboratories and continues not only through the machine's market intorduction but throughout the machine's entire subsequent history of production.

Viewed in economic terms, MF tests its products to provide protection for its own and the farmer's investment. Testing protects the company's investment because it: (1) reduces the time and money that would otherwise have to be spent on field rectification programs; (2) lowers warranty costs. It also reduces the pressure on dealers for service. Testing enables the company to locate problems which, if embodied in production models, would cost far more to rectify than the testing program itself costs.

Reputation and Quality

In addition to these direct economic considerations, MF's testing programs are dictated by the company's policy of providing quality products. MF knows it must adhere to this policy in order to maintain its reputation and improve its position in the industry.

Massey-Ferguson's ability to improve its position in the industry is, in the final analysis, based on its machines' reliability: the performance characteristic that the farmer can measure most easily and objectively. He does so virtually automatically by using the machine

and remembering the problems he experiences with it.

Suitability is a different concept. The company recognizes that the most reliable machine available is of marginal or no use to a farmer if the machine is not suited to his particular farming practices and needs. MF's answer is two-fold: (1) producing a full line of machinery with characteristics appropriate to those needs and practices; and (2) providing information to the farmer through the numerous media described in the company's brief, which enables him to make intelligent purchasing decisions.

Viewed another way, product suitability is established in the early marketing product development and engineering design stages. At those stages suitability is either successfully built in or it is not. The only way the farmer can get a "suitable" machine is through a careful purchasing decision. Reliability, on the other hand, is not finally "built in" until the machine comes off the assembly line. For it to be "reliable" at that stage means that its individual components must embody reliability through (1) their basic design, (2) the quality of their materials, (3) their actual manufacture or physical formation, (4) their relationship to surrounding or contingent components, and (5) through the quality of their assembly, one with the other.

Predicting Reliability

How does MF predict the reliability problems a typical farmer might

encounter using one of its machines? Reliability testing, based on sophisticated statistical methods, is the answer. The statistical approach is of utmost importance; for it alone enables the company to achieve economically the assurance, or statistical confidence, that its machines are reliable --as opposed to assurance based on known or individually demonstrated reliability. Stated differently, the company compromises --but it compromises through statistical knowledge. If machines had to be individually tested for reliability, MF could not afford to produce highly complex products such as tractors and combines; and the farmer could not afford to buy them.

The MF Continuum of Tests

From initial concept to manufacturing quality control, years after a machine's established success in the market, the company protects its own and the farmer's investment through a continuum of tests which blankets the entire engineering-manufacturing-market sequence at every juncture susceptible to undesirable happenstance or product quality deterioration for whatever reason. In general, the testing consists of:

- laboratory testing of prototype or initial production components for endurance and performance;
- engineering field testing of prototype machine for endurance and performance;

- customer use evaluation, i.e., field use by farmers of pre-production models to evaluate the machine's day-in, day-out performance under different crop and soil conditions;

- engineering laboratory tests of new production models' endurance and performance;

- engineering field surveillance testing of early production model machines;

- continuing reliability testing of standard production model components by the North American Quality Control Centre;

- endurance and performance testing of both new and current production models by the North American Quality Control Centre.

Massey-Ferguson has been improving its ability to more sufficiently encompass in laboratory testing --particularly in the earlier stages of machine development --the effects of various field conditions and operations on the increasingly complex machinery which the farmer requires today.

Advanced Testing Techniques

In short, the company was not satisfied with its ability to predict

a machine's performance. Consequently, over the last several years, MF engineers have been developing and applying advanced methods and techniques to more realistically simulate actual field conditions and the reaction of experimental machines to them.

The basis of these advanced techniques is the actual electronic recording, in the field, of a machine's reactions to any number of conditions encountered there. The machine is "wired" to a magnetic tape recorder. A single tape can simultaneously record on 16 channels, providing a record of the frequency and levels of speeds, stresses, strains, vibrations, temperatures, energy levels, number of gravities, hydraulic reactions, bounces and any other loads one wishes to measure. In addition, there is a verbal channel on which the operator can narrate the conditions he observes or state what maneuver or operation he is putting the machine through.

Tapes recorded in the field are returned to the engineering laboratories where analysis reveals the correlation of the machine's reactions, one with another as well as with the various loads and machine maneuvers and operations which have caused these reactions.

In order to conserve laboratory time, tapes are normally converted to an artificial time base. Essentially, this means condensing or shrinking the length of time required to play the tape without altering its information content or altering the internal relation-

ships of the data recorded.

The ratio of real time to artificial time varies from 1:1 to 1:100-plus. The ratio sleected depends on the later use planned for the tape and whether or not an artificial time base would distort the reactions of an experimental machine being controlled in the laboratory by the tape.

Economic Advantages of Advanced Testing Techniques

Beyond the obvious benefits of more realistic testing, there are significant cost advantages to the company's advanced techniques. These result largely from accelerating the developmental testing cycle through (1) having a taped "library" of actual field experience on hand to play against any appropriate machine and (2) through shrinking time absorbed in laboratory testing by converting field experience tapes to an artificial time base.

Also, to the extent that the field tapes more validly reflect field conditions than theoretically calculated conditions sometimes used previously, cost savings result through the adjustment of component specifications which will obviate later warranty or rectification costs.

Conversely, the company may be able to use less expensive components when it can demonstrate that earlier theoretical assumptions have led

to "over-built" components.

In the past, laboratory testing of machines has been based largely upon strain gauge measurements in the field or upon the theoretical calculation of forces the machine might actually encounter in the field. These forces were then translated into instructions governing laboratory equipment which would exert these forces upon the machine component in question.

If the theoretical calculations were based on somewhat unrealistic assumptions, the test results, of course, would correspondingly tend to be less than valid.

For example, it might previously have been assumed that the force applied to the leading edge of a cutter bar when it strikes a 50-pound boulder at three miles an hour would be 25 pounds per square inch. Laboratory tests of components would be based on the criterion that the cutter bar must be able to withstand perhaps 200,000 blows of such force. Tapes recorded in the field, however, might reveal that the actual force is 22 or 27 pounds per square inch.

The field tapes, appropriately converted to an artificial time base, are used in the laboratory to control dynamometers. These dynamometers apply the exact loads to the laboratory test machines or components that were actually encountered in the field.

If such tests reveal an unsatisfactory component condition or re-action, the component's specifications are upgraded. These specifi-cations are the basis for the manufacture of both the components which MF produces and those which it purchases. The North American Quality Control Centre, of course, tests production components against these same specifications.

Massey-Ferguson is using these advanced techniques increasingly in machinery development. The company's engineers, as yet, have not accumulated sufficient data to establish the true value of these techniques. However, an indication of the importance attached to their potential is the fact that this year the program, which now includes tractor, combine and baler testing, is three times as large as last year. Next year it will grow even more.

The company considers its test data to be confidential information with obvious competitive implications; therefore, data developed during testing are not made public.

These highly technical data are of prime importance to company engineers and manufacturing experts. The company believes, however, they would be of no practical significance to customers.

The Nerve Centre

At the heart of MF's testing and quality control activities is a

computerized communications and data processing centre in Detroit, commonly referred to as the nerve centre. It is used to help control the company's day-to-day, minute-to-minute operations in North America. It provides many services and capabilities which enable MF to react with great speed to many engineering, manufacturing and marketing situations. The computer enables company engineers and others to store and retrieve information in many significant forms. It also facilitates the use of this information for predictive purposes.

The company now routinely uses its nerve centre for the receipt and processing of information:

- on a daily basis from testing done at MF's experimental farms;

- generated by farmers cooperating with MF in the evaluation of pre-production models;

- on newly introduced production model machines.

This information, once processed, is at the engineer's disposal for many purposes. He can retrieve it on an incremental or an accumulative basis. He can direct the computer to cross-tabulate various categories of data it contains. These categories include field testing, customer use evaluation and new production model performance data by machine, by geographic area, by crop type, by soil type. The computer can also

compare the field results against laboratory results.

Overall, the centre can provide the engineer, on a daily basis, with meaningful test and evaluation data from throughout North America. And it can compare various categories of these data in ways to meet his professional needs.

As stated above, the centre receives information from the field on newly introduced production model machines. This is part of a very specialized engineering-manufacturing-marketing field surveillance and product improvement program introduced last year.

Here is how it works: field survey teams, each headed by a professional engineer, tour specified territories questioning users of new MF equipment, looking for problems before they occur. The teams report long distance each night to the nerve centre. There the reports are taped, transcribed, coded, programmed and fed to the computer. The computer, by projection on a Weibull probability curve, pinpoints problem areas in an early stage.

The next step is immediate notification of all concerned and is followed by engineering, manufacturing and/or field modifications, as appropriate. This is a new program and has produced gratifying results to date.

FARM MACHINERY WARRANTIES

As mentioned earlier, one of MF's motivations in its engineering and manufacturing test programs is the strict control of warranty and rectification costs. The effectiveness of these tests naturally contributes to the latitude of warranty coverage the farmer enjoys on his MF machinery.

New, unused Massey-Ferguson farm machinery is warranted to the purchaser by the dealer for 12 calendar months from date of delivery to the purchaser to be free from defects in material or workmanship which may cause failure under normal usage and service when used for the purpose intended. In the event of failure of a part or parts, exclusive of batteries and other trade accessories and replacement parts, and if, upon inspection, the company is satisfied that failure is due to defective material or workmanship, when used for farm or agricultural purposes, such defective part or parts will be repaired or replaced at the dealer's price at the company's expense. Further, all repair or replacement parts are warranted for 90 days from the date of replacement or the unexpired 12-month period, whichever is longer.

Minimum Inconvenience

For the farmer, this means that a failure occuring under the above conditions during the first year of his ownership will be rectified.

Moreover, it is the company's desire that the retification be accomplished with a minimum of inconvenience to the farmer.

Maximum Concern

A recent case in point involved one size of Massey-Ferguson tractor in 1966. On these tractors, power steering was standard equipment. Power for this steering feature was provided by an hydraulic pump supplied to the company as a complete component by another manufacturer.

This supplier discovered that it had built 400 pumps for MF with inferior material in the vanes. Material failure could cause the steering mechanism to lock rendering the tractor useless and possibly endangering the driver. No field failures, however, had been reported when the supplier notified Massey-Ferguson of the problem at 10 o'clock on a Friday morning.

Massey-Ferguson took immediate action. The supplier was able to identify the date of shipment of the faulty pumps. From this information and MF records, MF was able to identify the period during which it had installed this particular shipment of pumps. This led to a list of serial numbers of 1,400 tractors, any one of which might have had one of the 400 faulty pumps.

By noon, arrangements had been made with the supplier to provide rectification kits and to share the labor costs of installing them.

MF prepared letters of explanation for the owners of the 1,400 tractors and teletypes for all Massey-Ferguson divisions and branches outlining the problem, providing the suspect serial numbers and instructing them to inform all their dealers of the serial numbers.

Dealers were asked to alert customers who had purchased a suspect tractor and request the customer not to operate it over five miles an hour. Dealers were also to hold any suspect tractors they still had in inventory and to check their records against the possibility they had transferred one to another dealer and its serial number might not appear in his routine records.

All these communications were dispatched, and by 4 p.m. the company's five sales division headquarters and their 20 branches had the complete story and were notifying dealers. Before the day was over, dealers were telephoning owners of suspect tractors. Dealers followed up with letters in case the farmer had missed the phone call or did not fully understand the situation and the steps being taken to correct it. The emergency notification program continued through Saturday and Sunday.

Within the interim from initial notifications to rectification of the final tractors no serious incidents occurred. The purchaser's warranty, of course, protected him financially. The communications MF set into motion within hours of initial notification safeguarded

his physical well-being. This somewhat dramatic example illustrates the circumstances in which warranty and fast response are of prime importance.

MF would, of course, follow the same procedure under similar circumstances regardless of the origin of the faulty part.

Fields and Freeways

The Royal Commission has heard suggestions from certain earlier witnesses that farm machinery warranties should be similar to some automobile warranties, e.g., covering five years or 50,000 miles.

Massey-Ferguson submits that there are substantial differences in operating conditions and the basic purpose of the machines in question which must be recognized. Automobiles are ordinarily passenger vehicles primarily intended for conveyance of a few hundred pounds of human or other cargo from point A to point B. Connecting points A and B, is likely to be a smooth concrete or asphalt strip quite dissimilar to the terrain farm machinery must not only transverse, but must often transform.

Combines and Cars

The nature of normal highway vehicles, e.g., the automobile, is difficult to compare in any positive sense with that of self-propelled farm machinery. Difficult, because the assumed similarities, in MF's

opinion, are largely superficial. It is relatively simple, however, to summarize these similarities: normally both automobiles and self-propelled farm machinery are powered by internal combustion engines which burn some form of fossil fuel; and normally both move on wheels or some modifications of the wheel. The similarity, however, ends here.

It would, of course, be possible, at the risk of belaboring the obvious, to present an entire catalogue of dissimilarities between automobiles and combines or tractors, i.e., torque requirements, weights, types of engine design, etc., and between the conditions under which they operate.

The Dictates of Farm Machinery Design

When one considers the variety of conditions under which farm machinery must operate, and when one considers the variety of different mechanical and hydraulic systems which some farm machinery must employ, e.g., the self-propelled combine, and when one further considers the extreme physical forces, e.g., stresses, strains and vibrations from rough terrain, repeated imposition of extreme loads, etc., one would expect that farm machinery could never be engineered to last as long as the passenger automobile.

The reverse, however, is true. MF farm machinery must be engineered and manufactured to last longer than the automobile. It is and it does.

There is a simple reason why: if it were not, it would not perform at all to expectation beyond a short initial period, i.e., long enough for it to tear itself apart on the forces imposed on it in the field. Stated differently, what extra is required in quality of design, strength and quality of materials, and quality of workmanship, to enable the machine to perform well in the field, corresponds to the critical difference between the shipwrecked sailor who swims a mile to shore and his shipmate who swims 5,200 feet.

MF builds machines to ensure they make the full mile. And the full mile requires that the machines operate at top capacity for extended periods of time.

To run at top capacity over extended periods requires conscientious maintenance. This maintenance might be viewed as the machine's equivalent of training for the athlete who also must perform at peak output for extended periods of time. It would be more convenient and less bother if machines did not need maintenance and if athletes did not need physical conditioning; maintenance for machinery, at least, is necessary, if that machinery is to perform as advertised --a fact MF is continuously at pains to communicate to its dealers and their customers.

50,000 Miles ...And

Automobile manufacturers feel the same way: a circumstance not so widely heralded as the existence of the so-called "extended" or

5-year/50,000 mile power-train warranty now common in the automobile industry. These warranties clearly establish the owner's responsibility for providing required maintenance services which must be certified.

50,000 Miles ...Or

One such warranty, during the first two years or 24,000 miles, covers the entire vehicle but only against defects of material or workmanship. This warranty does not and is not intended to cover the normal wear, deterioration and related maintenance that are certain to occur through use. It does not and is not intended to cover wear or failure caused by accident, neglect, abuse or misuse of the vehicle.

50,000 Miles ...But

The same manufacturer's 5-year/50,000 miles power-train warranty warrants the following assemblies to be free from defects in material and workmanship under normal use and service for five years after delivery to the original purchaser or 50,000 miles of operation, whichever event occurs first, provided required maintenance services are performed and certified:

- engine block, head and all internal engine parts
- water pump
- intake manifold
- transmission case and all internal transmission parts

- torque converter

- drive shaft

- universal joints

- rear axle and differential

- suspension system (excluding shock absorbers)

- steering gear and linkage system

- wheels and wheel bearings

As a required condition to both the 24-month/12,000 mile and the 5-year/50,000 mile power-train warranty, the owner must have the following required mainteance services performed:

- engine oil changed every three months or 4,000 miles, whichever occurs first, and engine oil filter replaced every second oil change;

- carburetor air filter cleaned every six months and replaced every two years;

- in certain models, chassis grease fittings lubricated every 2,000 miles or three months, whichever comes first;

- once every six months, the owner must furnish an authorized dealer evidence that these required maintenance services have been performed at the proper intervals and have the dealer certify, on a form provided with the vehicle, (1) that the owner has furnished the dealer such evidence and (2) the vehicle's then current odometer mileage.

50,000 Miles?

These warranties do not apply to any passenger car that has been subject to misuse, negligence or accident, nor to any passenger car that has been repaired or altered outside of an authorized dealer or service centre so as to adversely affect its performance and reliability, nor to any parts or servicing required as a result of using parts not sold or approved by the automobile manufacturer.

These warranties also do not apply to parts replacements, mechanical adjustments, repairs or other servicing normally made or required as maintenance, such as replacing spark plugs, condenser, ignition points, brake and clutch linings, etc., or performing wheel alignments, wheel balancing, brake adjustments, engine tune-ups, cleaning fuel system, etc., or to normal deterioration of hoses, belts, upholstery, soft trim and appearance items due to wear and exposure.

Massey-Ferguson believes that any extension of its present warranty

terms would first necessitate a thorough consideration of the potentially resultant greater administrative costs to the company, particularly in light of the greater per-unit administrative costs to a farm machinery manufacturer compared to an automobile manufacturer with its substantially greater unit sales. Extension of farm machinery warranty terms would also require a consideration of the differences between the divergent characteristics of automobiles and farm machinery, their respective functions, and their operators' manner of use.

It should be noted, in addition, that the manufacturer has the right and, indeed, the obligation to recommend or request owners to use suitable parts and lubrication that comply with stated specifications; if such recommendations or requests were not honored, and parts or lubrication possibly harmful to the machine --or none at all --were used, the warranty could be voided.

Since it is economically infeasible for the company to test all "will-fit" parts and components of all suppliers in the market today for quality and compatibility with MF machines, the owner who used such parts or components could have his warranty cancelled if such use adversely affected the operation of the machine. Indeed, this caution is included in the retail warranty given to the farmer when he buys new MF machinery from his dealer.

MF believes in the warranty both as a competitive factor and for the ease of mind it provides the farmer. And the company believes its present warranty adequately protects the interests of the three parties involved: the farmer, the dealer and the company.

In the short view, the MF warranty provides enough economic penalty that it is obviously to the company's interest to produce machinery which does not require warranty services; in the long view, the damage to the company reputation in the market place --and the consequential long-term financial penalty that each warranty implementation can cause --is much more painful than the costs of the rectification in question.

Finally, it should be noted that MF warranty policy and terms are not static. The company is constantly reviewing and reassessing its warranties.

The performance of its machinery, whether from a warranty, i.e., reliability, or suitability standpoint is of continuing concern to the company. Another area of intense concern is the safety characteristics of its machinery.

FARM SAFETY

Massey-Ferguson engineers, through their design of the company's farm

machinery, have a principal role in MF's continuing efforts to provide the farmer with equipment which can be operated with minimum hazard. However, safe machinery is no guarantee of safe operation. Safe operation, to be sure, demands provision of well designed machinery. But only the farmer's own habits and attitudes will produce safe operation.

Under normal circumstances and operating conditions, the company believes that its machines are safe. Tractor design, for instance, is intended to provide optimum usefulness to the farmer and to give him the power he needs in the safest possible manner.

A Dual Approach to Safety

Consequently, at every stage throughout the entire development and testing cycle described earlier, design and performance criteria incorporate safety factors for the protection of the farmer. These include both (1) basic design of the equipment itself, e.g., shielding of moving parts, avoidance of dangerous protrusions, and (2) the application of human-factor engineering principles. These human-factor principles enable MF engineers to design machines that fit the operator's limitations and integrate him with the system he controls.

With reference to the first category, physical improvement of machinery is an area of constant study and innovation. Oftentimes, important

safety devices are not dramatic and consequently go unheralded; for example, properly placed hand grips, non-skid platform surfaces, safety lights, cushioned and spring-loaded seats with back support, positive transmission parking locks and low-elevation fuel tanks. More visible and more dramatic are roll bars and safety belts which are available on all MF tractors.

Shields and guards for revolving shafts, belt-and-pulley trains, gear trains and train drives which would otherwise be exposed have long been standard equipment.

Prominent warning decals are affixed to appropriate places on the machines warning the operator to shut off power before removing shields or housings to make adjustments and before clearing clogged portions of the machine, etc. Warning lights (varying by province and state) and slow moving vehicle signs for highway travel are standard equipment.

Use of Safety Shields

Shields are of particular importance in the protection they afford farm machinery operators for they surround or otherwise separate the moving part of the machine from the operator.

The MF 300 combine, for example, as standard equipment has safety shields protecting the operator from the following portions of the

machine:

- table drive
- reel drive
- motor
- grain pan drive
- rethresher drive
- clean grain auger drive
- distributor auger drive
- unloader drive train
- vertical auger drive gear
- unloader distributor positioning gear
- horizontal auger drive chain
- variable speed cylinder drive pulley
- straw walker drive

<u>None of these protective shields, however, afford the operator any protection if they have been removed</u>.

Removal of safety shields from various types of agricultural machinery, apparently in the interest of facilitating maintenance, is common practice. Indeed, a recent study by the Institute of Agricultural Medicine at the State University of Iowa showed that 67 out of 100 tractor power-take-off accidents studied occured because one or more of the manufacturer's shields were missing or had been removed.

The Experts Comment

One expert in agricultural accidents, L.W. Knapp, Jr., chief of the accident prevention section of the institute which conducted the study referred to above, states:

> "The unique accident which fits the occupational accident category in the strictest sense is associated with agricultural equipment that is, in general, designed to grasp, cut, pound, pull or shake agricultural products in such a manner as to render them usable to the farmer. This equipment, which is powered by electrical or gasoline motors ranging in size from a fraction of a horsepower to hundreds of horsepower, cannot be expected to be selective in its operation if hands, fingers or feet become entangled in their actions. It is because of this necessity of reducing vegetable matter into small pieces that agricultural accidents rank near first place among all types of

> accidents with respect to the severity of associated trauma. The tractor overturn, the power take-off accident and the corn picker accident are all examples of this category." (Editor's underlines)

Another expert in agricultural safety, Dr. Norval Wardle, extension safety specialist at the Iowa State University, states:

> "Many farmers do not realize that the tractor is changing. The tractor is becoming far more complex. Experienced tractor drivers often do not know enough about the tractors they are operating, what the machine will do under stress conditions, and just what its limitations are.
>
> "They forget that the tractor always does what the operator tells it to do through its controls.
>
> "Most farmers buy a tractor and take it home and head for the fields. They do not realize that their purchase was not confined to the tractor, but that it included knowledge about the machine.
>
> "The dealer owes it to the farmer to make sure that he is buying knowledge as well as a tractor and that

his customer knows as much as possible about the machine and its operation."

Safety Education through MF

Massey-Ferguson believes that its role includes helping the dealer to so educate the farmer. To this end the company:

- stresses safe maintenance and operation of machinery and proper use of safety features to dealers and their service and sales personnel attending North American Training Centre courses;

- stresses the same points in operator's manuals and through other written communications with dealers and farmers, e.g., FARMING TODAY, distributed to 150,000 Canadian farmers;

- stresses safety information in its face-to-face communications with dealers and farmers through the company's district managers;

- is one of the charter members of the Saskatchewan Safety Council, which MF has helped support since its founding;

- cooperates, both on its own and through the Farm and Industrial Equipment Institute, with rural

youth and dealer groups in development, financing and promotion of programs which, applied locally, increase farmers' knowledge and appreciation of good safety practices.

The Farmer Speaks

The need for more such activity by agricultural organizations is evident in the attitude of farmers as expressed by the executive secretary of the Alberta Federation of Agriculture who in March, stated before this Royal Commission:

> "This business of safety, we all talk about it and we are all in support of it but when it gets down to brass tacks there are a lot of us pretty careless about it. I think, if you were to say, 'Well, the roll bar is compulsory', there would be a certain amount of opposition. Now, just as an example, right now our farm organizations and our farm people generally have supported the idea of this slow moving vehicle and I understand now that it has been brought into legislation within the province and I am not so sure but that you wouldn't find a lot of criticism: 'Well, I've got to go to the expense of this and I've got to go to the trouble of that!' It is one of

> those things we talk about and when the chips are down, many of us try to dodge it."

A slightly different viewpoint was expressed by the president of the Farmers' Union of British Columbia when queried by the Commission:

> "...I think...that farm safety, of course, is the responsibility of the individual in more cases than not. I believe that machines have adequate safety devices...
>
> "...I believe that a lot of farm machinery...is used where it isn't proper to use this type of equipment. (This is a reference to slopes of ditches). It hasn't been designed for this type of use and, therefore, it is unsafe. However, I believe agricultural equipment, in doing the job it was designed to do, is certainly safe...".

Regardless of action, or lack of it, on the part of other members of the agricultural community, Massey-Ferguson intends to continue its engineering and communications efforts towards the improvement of rural health and specifically toward the reduction of accidents involving farm machinery.

PROVISION OF EMERGENCY PARTS

The company recognizes the vital necessity of providing fast emergency parts service and has organized its parts operation to provide such service. Moreover, MF is constantly re-evaluating its emergency service and introducing improved procedures to enhance that service.

What Is an "Emergency Part"?

As a matter of definition, an "emergency part" is one whose malfunction, from either normal wear or user abuse or misuse, has rendered a farm machine inoperative during its season of use, and which is then designated as an emergency by the dealer when he contacts the branch servicing him. In most instances, however, the dealer himself already has the part in his own inventory and thereby automatically prevents the development of an emergency supply problem.

The dealer's ability to forestall such emergencies is predicted on an analysis of the history of parts requirements, correlated with the seasonality of demand, and the subsequent advanced ordering of parts.

The rendering of fast repairs in emergencies, i.e., the actual fixing of the inoperative machine once the emergency repair part is in hand, is done either by the dealer's service staff, an independent repair shop or the farmer himself.

To increase the dealer's own service competence, MF offers dealer service personnel training at its service school located in Indianapolis, Indiana, a site centrally located with respect to MF's dealers in North America. The school possesses excellent classroom and other instructional facilities which is one of the reasons this particular site was selected. In the last eight years, more than 1,400 mechanics from MF's Canadian dealerships have attended this school.

Since dealers are independent businessmen, MF can exercise no direct control over the repair job itself. The company, however, does encourage dealers to provide fast, high quality repair service. The main point of MF contact with the dealer in this regard is the branch service manager and service representatives operating under him who advise dealers on service problems.

With further reference to the question of actually performing repairs, as opposed to the question of parts availability, MF believes that the farmer has an obligation to himself to ensure that his machinery be properly serviced prior to its season of use. Good sense, we believe, dictates this practice --rather than incurring the risk of the machine being down during its season of use.

MF has endeavored, through the publications and other means described in its brief, to inform the farmer what he can do to help maintain his machinery.

An Independent Appraisal

D.T. McFarlane, Saskatchewan minister of agriculture, has suggested that farmers should make field notes on problems, adjustments required, parts that need sharpening, reinforcing or appear severely worn during the seasonal operation of each machine. At the end of the season the machine should be cleaned and inspected. If commercial repairs are necessary, these should be arranged and performed early in the off-season. Massey-Ferguson agrees completely.

Similarly, the Alberta Wheat Pool brief made the recommendation that:

> "Farmers themselves can assist dealers by checking over out-of-season equipment and ordering parts well in advance of actual need. Major tractor overhaul, for example, should be considered during the off-season, if at all possible."

Again the company agrees and would also like to register its belief which dovetails with the implication of both Minister McFarlane and the Alberta Wheat Pool's statement: that farmers share a responsibility with the dealer and the manufacturer to keep their machinery running. MF further believes that, if these suggestions were put into practice, they would do much to reduce the possibility of a machine being down in the rush season.

Massey-Ferguson does not believe, however, that emergency maintenance problems can ever be 100 percent eliminated. Machinery will always be subject to wear and to the consequences of human error. MF does believe, though, that more concern with routine machine maintenance would reduce the farmer's concern with emergency maintenance.

Some dealers offer an incentive to farmers for off-season maintenance. Similarly, the company encourages farmers to perform less complex forms of maintenance by offering replacement part kits. This tends to relieve pressure on dealers, particularly during the rush season.

Also, through its dealers, the company encourages farmers to purchase a quantity of a particular part sufficient to fill their needs for a reasonable period of time.

<u>The Emergency Sequence</u>

What happens when a dealer is unable to supply an emergency part off his own shelf? First, it should be emphasized that no dealer, no sub-warehouse and no branch warehouse can stock all of MF's 100,000-plus parts. Nor is there need to, for the particular mixture of machines to be found in any one farming area served by a Canadian branch warehouse normally can be serviced with 17,000 to 35,000 different parts. Still, no dealer has the space or money to maintain an inventory of this dimension.

The parts he does maintain are carefully selected, based on the types and models of MF machines which farmers are using in the area he serves. Some of these parts are ordered at regular intervals on a semi-automatic basis. Others, for which the demand is more seasonal, are ordered and received weeks in advance of the anticipated need for them. These parts ordering programs explain why the dealer is able to supply, off the shelf, nearly all the emergency parts his customers need.

The exception occurs as the result of an unpredictable rash of trouble with a particular part, or as the result of the malfunctioning of a part which has a negligible history of trouble.

If the dealer does not have the part on his shelf, he must determine from the farmer if the lack of the part is causing an emergency. This is an essential point in the whole process of getting a replacement. For, if the dealer fails to notify his branch that his is an emergency order, the parts supply system will treat the request as routine. Dealers, of course, are continuously counseled by branch representatives to clearly designate emergency orders.

<u>MF Emergency Resources</u>

Once the dealer has signaled an emergency, the resources of the entire Canadian parts supply operation and the master North American Parts Operation warehouse in Racine, Wisconsin are brought to bear to provide the part.

Consider these resources a moment. First, of course, there are the inventories of other local MF dealers. The dealer may well attempt to obtain a part he temporarily lacks from a neighboring dealer. If the part is not locally available the dealer's recourse is then to his branch.

There are five branches in Canada. Each of them has its own parts warehouse. There are also four sub-branch warehouses. Each sub-branch carries approximately the same inventory as its parent branch's warehouse. These sub-branch warehouses plug the geographical gaps, so to speak, between the branches. In addition, there is a master parts warehouse for all Canada in Brantford. Supporting this activity in Racine, Wisconsin, is the master North American warehouse mentioned above which stocks over 100,000 different parts.

Finally, in the event of an emergency, the company can call on its factories to supply a part in current manufacture even if this would mean stopping the production run then underway. Such is MF's philosophy of meeting emergency situations.

The geographical location of each of these facilities, its breadth of inventory and its depth of inventory, have all been carefully rationalized in relationship to the prime area it serves and in relationship to the support it may be called upon to render other supply points in the total system. The breadth and depth of its inventory reflects the

interaction of these factors. All these resources, then, are at the disposal of the dealer who contacts his branch when he is unable to fill an emergency request.

Immediate Action

When the dealer contacts the branch, and the branch does not have the part needed, it takes immediate action to locate it. First, as a rule, all other branches and sub-branches in the general area, e.g., western Canada and the U.S. northwest, are telexed simultaneously in an effort to locate the item. When the part has been located, the nearest branch which has it sends it by the fastest method available directly to the dealer.

If no branch or sub-branch has the part, a request is telexed immediately to the master Canadian warehouse in Brantford. If the part is not available there, the request is referred at once to the master North American Parts Operation warehouse in Racine.

Emergency orders referred to Brantford or Racine automatically triggers the print-out of a shipping order, shipping label and dealer invoice. Such teleprocessing is planned for branches throughout North America by the end of 1969 and should help to further accelerate the receipt of emergency parts.

Speed

Three important aspects of the emergency ordering system may not be fully evident from this description. First, the speed of the querying process. The entire system can be searched in an hour or two.However, the further away from the requesting point the part is located, the longer, in general, it will take for that part, once found, to reach the farmer.

Distance

Second, the basic design and rationalization of the system enables the system to satisfy the vast preponderence of emergency requests closer to, as opposed to further away from, the dealers. About 95 percent of emergency orders are filled by the dealer's own branch; the other Canadian branches and their sub-branches collectively bring this total to about 98 percent. The remaining two percent must be obtained through the master Canadian warehouse in Brantford or North American warehouse in Racine.

Racine's inventory normally contains all MF parts. These are drawn, of course, from MF factories and in some cases, outside suppliers. The question might be asked, "If Brantford and Racine have such complete inventories, why doesn't the branch order directly from them rather than searching the system?" The answer is that the branch does, if it will get the part to the dealer faster.

Judgment

The third point, perhaps illustrated by the last statement, is that the system both demands and accommodates the exercise of judgment at each level. Such judgment is facilitated by telecommunications tying the system together and the frequent circulation of branch stock level reports. These reports enable parts men to tell at a glance which other branches may be able to supply a part.

The time span between the dealer's order and the receipt of the part --if it is available at his branch-- depends, of course, on the distance involved and speed of transportation available.

Where the Dealers Are

Approximately 43 percent of MF's Canadian dealers are within 100 miles or their branch and 83 percent are within 200 miles. Beyond 200 miles there is a considerable variation. For instance, in Saskatchewan, only 2.8 percent of MF dealers are 200 miles or further from Saskatoon; however, 28 percent of the MF dealers served by the Calgary branch are 200 miles distant or further.

These distances and the shipping times they generate obviously place a high premium on effective emergency communications. Each branch works in a number of ways to ensure that the dealers it serves avail themselves of the emergency parts service at their disposal.

Emergency Service Availability

First, there is direct and frequent personal contact between the dealer or his parts manager and MF's district manager and service representative. Secondly, there are periodic memos and bulletins that branches issue to the dealers they serve which explain emergency ordering procedures, remind the dealer that a busy parts service season is approaching, and emphasize the importance of des ignating emergency parts service as such. Finally, to provide the dealer the fast emergency reaction he and his customers need, there are the branch personnel designated as night, weekend and holiday telephone contacts.

Massey-Ferguson has noted with interest that presentations before this Commission last spring revealed that some farmers themselves are not aware of dealers' ability to accelerate parts service on emergency orders.

If the farmer does take the initiative in an emergency parts situation, sometimes he may not be able to contact his dealer. Sometimes dealers fail to specify that an order is an emergency order. And sometimes dealers fail to expedite emergency orders themselves --or through dealer oversight the emergency order may get sidetracked into a pile of bi-weekly orders.

In these circumstances the company has no real control. But it has, can, and will continue to encourage the dealer to take full advantage of MF's

emergency service to get his customers parts. In any event, the company will always, whatever the circumstances, endeavor to relieve the situation through use of unusual means to service the farmer.

How Long Does It Take?

How long does it take to obtain an emergency part? This question is impossible to answer. It should be stressed that the average dealer can probably hand to the farmer nine parts out of every ten he asks for. Only one time out of 100 will that tenth part be an emergency part --the lack of which is rendering a machine inoperative. Thus, in terms of total parts volume, only one time in 1,000 does the dealer's temporary lack of a part contribute to an emergency.

The process by which that part is found has already been described. An idea of how long the process takes is implicit in that description. MF possesses no records showing actual times elapsed; and with no records or figures in its possession it would be misleading to suggest an average time.

Consider the variables for a moment. The farmer is interested in the time elapsed from the moment his machine becomes inoperable until it is working again. Between these points in time he must contact his dealer; his dealer must contact the branch; the branch searches the system, finds the part, dispatches it; the dealer receives it and passes it to the farmer. Then the actual repair must be made. The portion of this

cycle over which the company has control, i.e., from branch receipt of the emergency order until dispatch of the part, may be quite small in comparison to total time elapsed.

The company does, however, possess figures showing the number of Canadian emergency part orders it could not supply from its warehouses compared to the number of routine part orders during the period January 9 - February 17, 1967. Of a total of 127,753 orders, only 59 --or less than one-half of one-hundredth of one percent-- were emergency orders which could not be filled from branch or master warehouse stocks. These had to be filled by MF factories or outside suppliers.

Without Regard to Clock or Calendar

Parts emergencies, particularly during the farmers' busiest periods, e.g., harvesting, occur without regard to the clock or the calendar, at night, on weekends and on holidays. Consequently, as stated earlier, dealers are furnished the home phone numbers of branch parts supervisors, order clerks, warehouse foremen, sales managers and the branch manager himself. Dealers frequently contact these men at their homes at night.

In general, branches are staffed with parts men on Saturdays, at least half a day. Over weekends and holidays, if the branch is not manned, parts personnel can be contacted at their homes. It should be noted that provincial and municipal implementation and adoption of, or municipal bylaws reflecting, the Lord's Day Act, or other laws limiting

the period during which business may be conducted, may delay parts services in some areas of Canada. Lord's Day laws also restrict the flow of commercial transportation on Sunday.

Both the Brantford and Racine master parts depots work on a split-shift schedule to meet emergencies. The company objective on emergency orders is same-day shipment, whether from a branch warehouse or a master parts depot. In most cases, this objective can be met if the order is received by at least 4 p.m. and, in some cases, as late as 5 p.m. Special delivery is made of emergency parts to railroad and air terminals. Emergency shipping costs are prepaid by the company and later recovered from the dealer. This may accelerate the dealer's receipt of the emergency part.

Last year, 94.4 percent of all orders for branch-stocked parts were filled from the branch initially receiving the order, and shipped either on the same day the order was placed in the case of emergency orders, or before a mutually established deadline on routine orders. In no month did the fill-ratio from the nearest warehouse fall below 92.9 percent. An additional three percent of the total received similarly fast service from neighboring branch warehouses. The remaining orders were filled on a priority basis, if necessary, from the master parts depots at Brantford or Racine.

The Keynote: Continuing Improvement

There has been a steady improvement in the percent of orders filled from

the nearest warehouse since the institution of centralized inventory control in 1958 and its computerization the following year. Prior to 1958, a fill-rate of 85 percent was considered the best attainable. By 1963, the average for the year had risen to 92.3 percent. As just stated, the 1966 figure was 94.4 percent.

In spite of this notable improvement, however, delays and mix-ups on parts service do occur from time to time. Some of these shortcomings are undoubtedly the result of human failings within the company, but many stem from ordering procedures, delays, or inaccuracies at the dealer or farmer level. The company constantly strives to minimize such errors, as mentioned earlier, by keeping dealers up-to-date on ordering procedures and providing dealers full opportunity and assistance in maintaining adequate parts inventory.

More Woes to Overcome

It should be recognized that the company faces some problems largely beyond its control. Outside suppliers, for example, sometimes fail to meet delivery schedules. At the end of February, this year, 1,474 different kinds of parts in various quantities, were 90 days overdue from outside suppliers. Another 706 were 60 days late and 986 more were 30 days late. To counteract late delivery, MF orders as far in advance as reasonably possible, follows up all orders before their due dates and continuously seeks alternative sources of supply. MF believes that, to the extent it is within its power, it is doing what is possible

to rectify delays from outside suppliers.

Also, parts supply to MF is sometimes interrupted by strikes at MF and at outside suppliers' factories. Transportation strikes also delay delivery, as does the exceptionally inclement weather which occurs not infrequently during the critical planting and harvesting seasons.

The Commission has asked, "Do you feel there is any justification for complaints by Canadian farmers about the difficulty of getting repair parts or of the delay that often occurs before a part is available?" With reference to Massey-Ferguson the answer has to be, "We feel there is very little justification." MF certainly does not agree that "often" is the most precise word with which to describe the frequency of delay in obtaining MF parts.

Overall, the present state of repair parts availability and service is the result of studies and improvements begun over 10 years ago. These are continuing today.

The need for high quality repair parts and service is keenly felt throughout the company and routinely receives priority treatment. The attention paid repair parts parallels that accorded wholegoods in every way. However, the huge number of repair parts and the emergency nature of some parts service intensifies the concern MF devotes to this portion of the business.

THE ROLE OF ADVERTISING

The role of advertising in a consumer-oriented economy is a traditionally controversial subject. For example, the charge of misrepresentative advertising is easy to make and, practically speaking, impossible to disprove except in a legal sense. The most that can be done to "disprove" it is to attempt to establish MF's good intent.

Naturally, MF is interested in selling tractors, combines and its whole catalogue of farm machines. To market them at least expense to the farmer, MF believes it must advertise them. But the company is absolutely opposed to and does not practise false representation of its machines, their performance or capabilities --and for two very good reasons: first, it would be dishonest to do so; second, it would be bad business to do so, costing far more in the long run than the short-time gains could offset.

"False Demand"?

Considering a slightly different aspect of advertising, one sometimes hears the charge that advertising is used in this and other industries to create false demand. False demand is a complex subject, and any thorough and accurately detailed treatment of it and its ramifications would require all the skills social science offers. However, the company viewpoint, which is several-fold, should be stated: namely, that false demand, in any sense that it might be applied to the farm

machinery industry, is not a purposefully induced force which can be let loose on the market.

If false demand seems to exist from time to time, it might more accurately be termed an aberrant, unpredictable and short-lived instance of consumer behavior over which the farm machinery industry certainly has no more control than those who are manifesting such behavior.

The personality and social needs which might be satisfied by powerful tractors are not significantly fed or excited by advertising; they are fed by many factors within each individual's total environment of which farm machinery advertising constitutes a minuscule proportion.

A False Issue

Finally, with regard to false demand, to the extent that it may exist, MF believes it to be an uncontrollable, but self-eliminating, phenomenon. As such, it does not offer this industry the characteristics necessary with which to wield it. Massey-Ferguson believes that false demand is a false and synthetic issue.

When "Too Much" Is Only Enough

The concept of "false demand" is closely related to the idea of having "too much" or "too powerful" machinery. In this regard, it is interesting to note an article in the May 1967 COUNTRY GUIDE. This article, called "Making Farm Machinery Pay", was written by A.R. Jerry Jones,

supervisor, farm management branch, Alberta department of agriculture. In it Mr. Jones expresses his opinion that very few farms are over-mechanized:

> "In the farm management branch, we analyze and interpret thousands of farm records. Seldom do we see any evidence of extravagance in machinery purchases. Sometimes too little machinery is purchased to do an effective job.
>
> "It is often said that farmers buy too big a tractor or too large a combine for their farm. But most farmers need some reserve capacity. They might, for instance, get away with a four-plow tractor if everything went right. But sometimes things don't go right. Rain may delay field operations. A larger tractor or a larger combine has reserve capacity which enables you to make up for lost time..."

Information Costs

Turning now to a consideration of advertising expense, some critics have suggested that advertising adds burdensomely to prices. In 1966, MF spent $769,000 on farm machinery advertising and sales promotion in Canada. This was about 0.65 percent of the retail sales of the machinery in Canada. In other words, the "advertising bill" to the farmer who purchased a $5,000 tractor last year was about $33. What did he get for his $33? Essentially he got information which enhanced his ability to

choose. Consider the following quotation:

> "The task of our...advertising is to give people exact information about the goods on sale...and to explain their uses to the consumer...to give a truthful, exact, apt and striking description of the nature, quality and properties of the goods advertised."

In this, MF agrees with the writer, Anastas L. Mikoyan. Taking this thought one step further, and back to the capitalistic arena, MF believes that "informative" advertising sells more product, i.e., is more persuasive than "persuasive" advertising. Certainly, it does the consumer more good.

This is why Massey-Ferguson's practice is to provide a flow of information directly and indirectly to the potential customer through cooperation with farm publications, product brochures and information manuals, special articles, tours, films, training courses for company and dealer employees --all in addition to advertising itself.

The Semantics of Technicality

MF does not claim that this information is "technical" in the sense the company assumes the word has been used by the Commission. But MF does believe the information it provides is legitimate, meaningful --and, indeed, helpful-- to the farmer in his purchasing decisions. MF believes, on the other hand, that the provision of "technical" data to the farmer

with reference to his own immediate farm's environment is a practical impossibility.

The practical usefulness of technical data to the individual farmer is also, in Massey-Ferguson's opinion, highly questionable. Would he, or could he, use it? If the farmer thought such information essential someone --commercial agricultural publications or independent and disinterested, professional third-party group perhaps-- would provide it. Basically, MF believes that such data are not meaningful to farmers. Even if they were, they should be certified and presented by a disinterested party, rather than by individual manufacturers, to minimize confusion and increase acceptance.

The Dynamics of Machine Improvement

The suggestion or implication has arisen at certain earlier hearings of this Royal Commission that farm machinery manufacturers make technically unnecessary model changes and changes within models. Part of the apparent objection to machinery changes and improvements relates to the higher price which newly introduced machines may bear compared to their predecessors. When this occurs, the increased price is due to a combination of several factors perhaps including (1) continued inflation of material and labor costs which occurs and has to be met regardless of the innovations embodied in the new machine; (2) the cost of engineering and manufacturing set-up for the new machine; (3) the net additional effect, if any, of increased material and labor input to the new machine;

and (4) customer value added in the new machine through increased capacity, technical capability and reliability.

In effect, the suggestion has been that changes are made without justification in terms of agricultural economics and that they are made solely to create the mistaken impression in the prospective purchaser's mind that his present machine is obsolescent or obsolete and that he would be wise to obtain new machinery. This suggestion bears no resemblance to MF's approach in fulfilling market demands, although it should be noted that it would be most difficult for the company to differentiate between a farmer's emotional response and one based on his analysis of the economics involved. The company's dealers, however, can and do advise prospective customers on the suitability of machines with respect to those customers' individual farming requirements. It is, however, impossible for the dealer to <u>control</u> the purchase decision. The ultimate decision must rest with the purchaser; hopefully he will make it based upon economic principles of modern farm management.

To serve the dictates of modern farming and farm management, machinery manufacturers do indeed introduce new models and do make changes within existing models. These changes, in general, result from one or more of the following considerations:

- the desire, for a number of reasons, to increase machine performance or productivity and reliability and/or suitability;

- the necessity to meet and overcome competition, i.e., to protect and, hopefully, to enlarge one's share of market.

For these reasons, from the standpoint of the individual farm machinery manufacturer, there can never be such a thing as a final or settled,i.e., ultimate, piece of farm machinery.

However, the suggestion for such an ultimate apparatus possesses certain surface appeal. This appeal seems to stem from an idealized concept such as that embodied, say, in the standard Volkswagen automobile, an automobile which seems to have successfully met the transportation needs of millions for close to three decades with <u>little evident change</u>. <u>Little evident change</u>, because each year's new standard VW model brings a substantial number of changes which are not readily apparent. These changes are tailored to the needs of the particular segment of the world-wide market which VW serves --as are the changes MF makes in its various models which each serve their own particular segment of the agricultural tractor market.

In addition, it should be noted, that individuals' transportation requirements --the vast magnitude of automotive model changes notwithstanding-- have remained relatively static over the past three decades compared to the demands placed upon farmers for greater and more efficient production over the same time span.

In the changes it has introduced, Massey-Ferguson believes that it has achieved its goals of increased performance and reliability.

It is, of course, true that every claim for improvement in these characteristics --indeed, any claim for improvement across the entire spectrum of human behavior-- carries with it the implicit admission that previous efforts were not entirely satisfactory. Such a viewpoint, however, can be reduced to the absurd conjecture that perfection must or should exist as the initial condition. If this viewpoint were adopted as an operating philosophy it would automatically negate the possibility of achieving any improvement, a condition contrary to fact in the real world in which achievements are measured against possibilities implicitly limited by the presently available state-of-the-art.

It should also be stated that in this real world Massey-Ferguson cannot afford to produce changes with abandon. Change carries a price tag. That price tag represents considerable risk to the company until the new machine or the machine with new or changed features has established its success in the market.

The company would be derelict to gamble its resources bringing new machines or features to the market which it was not reasonably convinced would meet farmers' needs significantly more effectively than machinery already available. These costs include those associated with

(1) development and testing; (2) new tooling; (3) production change-over; (4) inventory obsolescence; (5) new product introduction expense such as preparing new parts books, service manuals, assembly instructions, operator's manuals and sales literature.

COMMUNICATIONS WITHIN THE AGRICULTURAL COMMUNITY

The company undertakes many communications activities conveying information which MF considers useful to farmers and many other segments of the agricultural community.

In fact, Massey-Ferguson considers the entire information spectrum between (1) the sociological and economic importance of agriculture on a worldwide, national or regional level, and (2) meaningful technical information of benefit to the farmer to constitute its legitimate scope of communications with others in the agricultural community.

Some of these communications, i.e., tours of MF plants or farms, would normally be considered as "actions"; others are paid communications, e.g., advertising; still others are financial contributions. Stated differently, formal written communication is only one portion of a broad agricultural communication program. This program, for example, has for many years included substantial contributions to Canadian colleges and universities for research, scholarships or other purposes. Not all of this money is specified for support of studies relating to

the traditionally recognized sub-branches of agriculture; for the company takes the viewpoint that other studies, e.g., econometrics, will eventually benefit the entire nation including the agricultural community.

Other MF contributions go to universities and other educational institutions, scholarships, hospitals and other health organizations, community services, and miscellaneous causes; and the same rationale applies: these contributions should eventually benefit the entire nation including the agricultural community.

Perhaps of greater significance in terms of more direct and immediate benefit to the agricultural community is the MF program of loaning or leasing farm machinery to agricultural colleges, universities or other institutions to familiarize future agricultural leaders with the company's products and to encourage agricultural research. The value of the machinery in these programs in Canada is substantial.

The company maintains these communications programs because it recognizes the importance to the agricultural community of the development, formalization and promulgation of new knowledge. Underlying this recognition is the company's awareness of the rapidly changing Canadian agricultural scene.

The company believes that this acceleration of rural change has many implications for itself and others in the agricultural community. For this reason MF is particularly pleased to note the scope of this Commission's inquiries and the Commission's numerous studies which should help answer the questions which relate to or arise from fast-paced change in Canadian agriculture.

Hopefully, the results of the Commission's studies --and other professionally conducted studies-- will be communicated to interested groups in the agricultural community whose need for such information is not matched by their ability to develop it themselves.

In such a way the total information available to the agricultural community would be enhanced far beyond the ability of the farm machinery industry to do so. This new information would be useful to the farm machinery industry in the planning required to meet its obligations in the market place as well as to other agricultural groups --and, indeed, to the government in the development of public policy.

FARM MACHINERY FINANCING

The company, in its recent history, has been called upon --and responded-- to assist both dealers and farmers financially.

In the case of farmers, the need has been and continues to be for assistance in financing the purchase of both new and used equipment, partly because of the seasonality of farm income.

Dealers require help not only with machinery and parts acquisition but also with capital expenditures for starting their dealerships and with the working capital to continue operating them.

Over the years MF has evolved a number of plans expressly tailored to the various financial needs of both farmers and dealers. MF intends to continue this service. More plans are presently under study, and these will be introduced if and when the company is reasonably convinced that these plans will satisfy the needs they are intended to fill.

The plans that are presently in effect are described in detail in the MF brief. One of these, however, requires special comment here.

"Floor Planning"

The company and its dealers consider it highly desirable for dealers to have a reasonable selection of wholegoods on hand. Immediate availability for delivery to the farmer is an obvious advantage. A reasonable selection of machinery on hand also enables potential customers to inspect machines and witness demonstrations.

Conversely, the absence of a machine inventory places the dealer at a considerable competitive disadvantage --both with regard to delivery and the farmer's natural desire to operate the actual machine rather than just see a picture of it.

To fulfill this machine inventory need, the company has for tractors a one-year interest-free machinery purchase plan for dealers known as "floor planning". For other farm machinery the term may be as long as 23 months.

A Necessary Evil

The company recognizes the unfortunate necessity for providing this interest-free inventory. However, there should be no mistake about MF's basic attitude toward floor planning. Floor planning, for all the benefits it provides the dealer and for all the ability it gives the dealer to serve his customers better, represents considerable expense to the company.

The company has continuously investigated various possibilities for reducing or eliminating floor planning expense. To MF's knowledge, the farm machinery industry is the only capital consumer goods manufacturer which is forced to carry its dealer inventory on such liberal terms, if at all. Floor planning appears, under present economic circumstances in the agricultural community, to be a necessary evil for manufacturers.

MF believes its plans, however, are desirable from the dealer and farmer's point of view and have been accepted because they have fulfilled several necessary functions. They have enabled farmers to acquire machinery they needed which they might not otherwise have been able to purchase.

By so doing, the plans have also enabled the company and its dealers to produce more sales. Furthermore, they have accommodated MF's manufacturing schedules and probably have helped to increase the company's manufacturing efficiency. Perhaps most important, they have been a powerful influence in building and maintaining the efficient dealer organization required to serve the farmer.

CANADIAN - U.S. WAGE PARITY

Finally, Massey-Ferguson must comment on the subject of wage parity. The Commission over a year ago asked the company:

> "How and to what extent is the drive for wage equality between Canada and the United States likely to affect the competitive position of Canadian production?"

Massey-Ferguson's answer to this and other related questions posed by the Commission are developed at considerable length in the company's brief.

As one might expect, answers to such questions are not simple. However, in the interest of the company's Canadian employees, suppliers, shareholders, dealers and customers, the following general conclusions with respect to wage parity must be stated:

- a move to wage parity without an offsetting devaluation of the Canadian dollar would affect Massey-Ferguson more than its major North American competitors, placing especially great pressure on MF to minimize the cost consequence of such a development. Competition would not permit the company to offset such cost increases simply by raising prices;

- wage parity could influence present plant locations and would influence future plant locations;

- the high cost of closing and relocating existing facilities might well postpone such action, but this would depend on the price the company could obtain for its properties. However, some shifts in the sourcing of components and a restructuring of facilities to substitute capital for labor could occur before actually changing the location of any existing factory buildings;

- even now, relative costs are such that the penalty of locating in the U.S. some plants engaged solely in

assembly operations is sufficiently low for such costs to be outweighed in some cases by assumptions concerning increased market penetration, more supporting industries and increased labor efficiency; in that event, however, the question of location of primary plants would also have to come under review;

- with existing Canadian-U.S. relative wages, it would seem feasible for the company to continue its past tendency to locate its more labor-intensive North American manufacturing activities in Canada. With wage parity --but with no further devaluation of the Canadian dollar-- such a policy would no longer be economically attractive.

SUMMARY

Massey-Ferguson hopes this presentation has helped create an understanding of the basis upon which the company conducts its worldwide enterprise; and also of the relationship of the company's operations in North America to the total worldwide enterprise. Within the worldwide enterprise, MF operations in Canada play an important, but by no means dominant, role.

Massey-Ferguson believes its integrated international manufacturing and marketing complex creates a crucial distinction between it and other large organizations on this continent with some overseas dependencies or appendages.

Massey-Ferguson is a multinational corporate composite. Through the worldwide integration of its engineering, manufacturing and marketing it is geared both to the needs of the individual areas in which it operates and the universal agricultural needs.

Massey-Ferguson believes that its combination of management skills operating within its continuously evolving organizational framework produce for it and for its customers the maximum in presently attainable efficiency. This is not to say that MF has solved all the problems of international trade. But MF does believe it has developed an approach to international business --and an ability to adapt itself to the requirements of international business-- which enables MF to accommodate the needs of the world's farm machinery markets.